

# TENNESSEE ARMY NATIONAL GUARD

## FINAL ENVIRONMENTAL ASSESSMENT PROPOSED LASER-FIRING TANK RANGE AND ARTILLERY MANEUVER AREA *ARNOLD AIR FORCE BASE TULLAHOMA TENNESSEE*



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**FINDING OF NO SIGNIFICANT IMPACT  
PROPOSE LASER FIRING TANK RANGE AND  
ARTILLERY TRAINING AREAS  
ARNOLD AIR FORCE BASE, TENNESSEE**

Pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508), Department of Defense Directive 6050.1, National Guard Bureau Regulation 32 CFR 651 and Air Force Regulation (AFR) 32 CFR 989, National Guard and Air Force must consider environmental consequences when authorizing or approving major federal actions. The attached environmental assessment (EA) analyzes environmental consequences of the Air Force allowing the Tennessee Army National Guard (TNARNG) to utilize 1264 acres of land for development of proposed new training areas, which would occur on Arnold Air Force Base (AFB) property. The EA is incorporated by reference and includes involvement by Tennessee Historical Commission, U.S. Fish and Wildlife Service (USFWS), Tennessee Wildlife Resources Agency (TWRA), Natural Resource Conservation Service (NRCS) and other agencies.

**Alternatives Eliminated from Review**

Several alternatives including the proposed action and no-action alternative were identified. However, upon further evaluation, it was determined three of the alternatives failed to meet reasonable selection standards of compatibility with short- and long-term plans of TNARNG and Arnold AFB and were eliminated from review. The three alternatives included reconfiguring the existing training area at Tullahoma Training Site (TTS), developing the entire South Camp Forrest area at Arnold AFB using different configurations of training areas and using existing training facilities at Fort Campbell TN and Fort Knox KY (Chapter 3, pages 3-1 to 3-3).

**Proposed Action**

Under the proposed action 1264 acres south of the current TTS would be developed into a laser firing tank range and artillery maneuver area. The tank range would consist of two firing lanes placed on existing roads, approximately 25 targets, a 50-60 feet observation tower and a 7-acre staging area. Approximately 10,000 feet of existing roads (4.6 acres) would be utilized to return tanks from the training run to staging area. In addition a line of sight from the observation tower to the targets would be maintained. Ninety acres of vegetation would be managed to a height no greater than 3 feet and around each target, the vegetation height

would be less. The total area impacted by the proposed laser firing tank range would be approximately 102 acres. By using laser firing, crews would be able to perform gunnery functions as they would in combat situations.

The artillery maneuver areas would include six 5-acre plots for artillery set-up and simulated fire, a 12-acre staging area and use of 22,000 feet of existing road (16-20 feet wide encompassing approximately 10 acres). The total area impacted by artillery maneuver area would be approximately 52 acres. Of this total, 42 acres would be hard surface and 10 acres would consist of existing roads. Each 5-acre plot would be located adjacent to existing roads or with short connector roads. Roads connecting the maneuver areas would be improved as needed to support military training vehicles. These maneuver areas would allow TNARNG to conduct higher-level training exercises more efficiently and cost-effectively.

Personnel from TNARNG would utilize these training areas approximately 2-4 weekends per year for artillery brigade and 4-8 weekends per year for tank units. This would result in an anticipated average usage of 6-12 weekends per year (Section 2.2, pages 2-2 to 2-5).

### **No-Action Alternative**

Under the no-action alternative, development of 1264 acres by TNARNG to expand and improve their existing training capabilities would not occur. Armored brigades would continue to travel additional hours to receive training; thereby reducing actual man-hours spent on drilling. Mobilization costs would continue to increase for TNARNG. Scheduling conflicts with TNARNG and active duty units would continue to occur at existing training facilities (Section 3.3, page 3-3).

### **Environmental Consequences**

This EA analyzes potential environmental impacts associated with geology and soils, water resources, air quality, biological resources, cultural resources, noise, hazardous materials and waste management, solid waste, land use, socioeconomics, environmental justice and safety concerns. Environmental impacts associated with the proposed action will be minimized to insignificant levels by implementing the following operational procedures:

- Avoiding contact with areas of known habitat for current endangered species populations and following base-wide management plan for species conservation (Section 5.6.1.2, page 5-9)
- Maintaining natural drainage patterns by keeping roads in good repair and graded to natural contours (Section 5.4.1.2, page 5-7)



- Avoiding impacts to state listed species by not scheduling training during times when species are migrating or during various hunting seasons (Section 5.1.1.1, page 5-1)
- Establishing site-specific buffer zones around wetlands (Section 5.6.1.2, page 5-10)
- Avoiding areas with identified archeological sites as well as high probability areas for archeological remains (Section 5.7.1.2, page 5-14)
- Minimizing noise by precluding armor and artillery training during traditional community Sunday morning quiet hours, holidays and other similar occasions to prevent disruption of surrounding civilian activities (Section 5.3.1.3, page 5-5)

The establishment of training areas would result in loss of 114 acres of commercial pine forest. Because much of this forest is presently affected by the northern pine beetle and has been cut to reduce the spread of this pest, only a small area (less than 30 acres) of commercially valuable timber is affected by the proposed action.

The present use of this area as dove hunting fields would not be impacted and training would not occur on opening weekends during dove season. The TNARNG will coordinate their training schedule through Arnold AFB and TWRA to avoid other desirable hunting weekends as much as possible. During artillery training, biking and hiking will be restricted to alternate trails (Section 5.1.1, pages 5-1 to 5-2).

According to Tennessee Historical Commission there are no identified archeological sites in the proposed training areas that are eligible for listing on the National Register of Historic Places (NRHP). Because tank and artillery training areas are not located at or adjacent to streams, the proposed action would not impact potential NRHP sites typically found in these areas. Roads connecting to the artillery sites cross some intermittent drainages; however, these areas will not be impacted other than where current roads exist. Any inadvertent discovery of archeological remains during training will be immediately reported to Arnold AFB Cultural Resources Manager (Section 5.7.1, pages 5-13 to 5-15).

### **Mitigation**

Buffer areas required by the USFWS and Corps of Engineers will be established around jurisdictional wetlands to preclude vehicle movement into these sensitive habitats. The buffer area size would be 100 feet or site-specific and will be established by TNARNG in coordination with Arnold AFB Natural Resources Manager where vehicle operations will be close to these wetland areas (Section 5.6.1.3, page 5-11).

The proposed action is located within Eggert's sunflower's habitat, a federally listed endangered species. To minimize impacts to this species, the entire area will be surveyed prior to construction to determine the most current distribution of the Eggert's sunflower. Firing targets will only be placed in pre-approved sites. In addition clearing of the over story vegetation and sequential maintenance of open vegetative areas will be performed in a manner that benefits and improves future productivity of the Eggert's sunflower. Monitoring activities will be conducted to track population trends on the 1264-acre site. Survey results will be sent to USFWS for review and concurrence (Section 5.6.1, pages – 5-9 to 5-13).

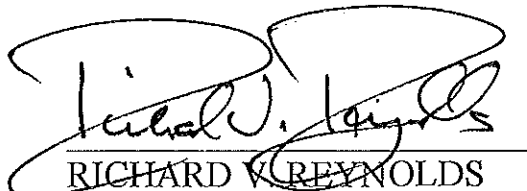
State listed plant species also occur in the proposed training areas. These species (sand cherry, Shinner's falseglove and dwarf sundew) will be avoided.

### **Public Review**

A public notice for intent to sign a Finding of No Significant Impact (FONSI) was made on 17 Dec 04. The draft FONSI and EA were made available to the public upon request. No comments were received.

### **Finding of No Significant Impact**

Based on my review of the EA, I conclude that the Air Force support and participation in TNARNG's proposed action will not have a significant adverse impact, either individually or cumulatively with other foreseeable actions, on the quality of human or natural environment. This analysis fulfills requirements of NEPA, the Council on Environmental Quality's regulations and AFR 32 CFR 989. An EIS is not required and will not be prepared.

  
RICHARD V. REYNOLDS  
Lieutenant General, USAF  
Vice Commander

Date: 3 Jun 05

## **TABLE OF CONTENTS**

<b>EXECUTIVE SUMMARY</b>	<b>ES-1</b>
<b>1.0 PURPOSE OF AND NEED FOR ACTION</b>	<b>1-1</b>
1.1 INTRODUCTION	1-1
1.2 PURPOSE AND NEED	1-1
1.3 SCOPE OF THE ENVIRONMENTAL ASSESSMENT	1-3
<b>2.0 DESCRIPTION OF PROPOSED ACTION</b>	<b>2-1</b>
2.1 INTRODUCTION	2-1
2.2 DETAILED DESCRIPTION OF THE PROPOSED ACTION	2-2
<b>3.0 ALTERNATIVES DEVELOPMENT, ALTERNATIVES, AND NO ACTION</b>	<b>3-1</b>
3.1 ALTERNATIVES DEVELOPMENT	3-1
3.2 ALTERNATIVES ELIMINATED FROM FURTHER ANALYSIS	3-1
3.2.1 USE OF TTS	3-1
3.2.2 ALTERNATIVE USES, SOUTH CAMP FORREST AREA	3-1
3.2.3 USE OF FORT CAMPBELL OR FORT KNOX ALTERNATIVE	3-2
3.3 NO ACTION ALTERNATIVE	3-3
<b>4.0 AFFECTED ENVIRONMENT</b>	<b>4-1</b>
4.1 LOCATION DESCRIPTION	4-1
4.2 LAND USE	4-2
4.2.1 ARNOLD AFB GENERAL PLAN	4-2
4.2.2 LAND USE AT THE PROPOSED TRAINING AREAS	4-3
4.2.3 OFF-SITE LAND USE	4-3
4.3 AIR QUALITY	4-4
4.3.1 AMBIENT AIR QUALITY	4-4
4.4 NOISE	4-5
4.4.1 EXISTING NOISE LEVELS	4-6
4.5 GEOLOGY AND SOILS	4-7

4.5.1	PHYSIOGRAPHY AND TOPOGRAPHY	4-7
4.5.2	STRATIGRAPHY	4-7
4.5.3	GEOLOGIC STRUCTURES	4-8
4.5.4	MINERAL RESOURCES	4-9
4.5.5	SOILS	4-9
<b>4.6</b>	<b>WATER RESOURCES</b>	<b>4-10</b>
4.6.1	SURFACE WATER	4-10
4.6.2	WATER QUALITY	4-13
<b>4.7</b>	<b>BIOLOGICAL RESOURCES</b>	<b>4-15</b>
4.7.1	TERRESTRIAL RESOURCES	4-15
4.7.2	WILDLIFE	4-18
4.7.3	AQUATIC RESOURCES	4-19
4.7.4	WETLANDS	4-19
4.7.5	THREATENED, ENDANGERED, AND MANAGEMENT CONCERN SPECIES	4-20
<b>4.8</b>	<b>CULTURAL RESOURCES</b>	<b>4-21</b>
4.8.1	PREHISTORIC RESOURCES	4-21
4.8.2	HISTORIC RESOURCES	4-22
4.8.3	NATIVE AMERICAN RESOURCES	4-24
<b>4.9</b>	<b>HAZARDOUS MATERIALS AND WASTE MANAGEMENT</b>	<b>4-25</b>
4.9.1	HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT	4-25
4.9.2	INSTALLATION RESTORATION PROGRAM SITES	4-25
4.9.3	UNDERGROUND STORAGE TANKS	4-26
4.9.4	ABOVEGROUND STORAGE TANKS	4-27
4.9.5	FILTRATION PLANT/WATER TREATMENT PLANT	4-27
4.9.6	ASBESTOS	4-27
4.9.7	PESTICIDES	4-28
4.9.8	POLYCHLORINATED BIPHENYLS	4-28
4.9.9	ORDNANCE	4-28
<b>4.10</b>	<b>SOLID WASTE</b>	<b>4-28</b>
<b>4.11</b>	<b>SOCIOECONOMICS</b>	<b>4-29</b>
<b>4.12</b>	<b>ENVIRONMENTAL JUSTICE</b>	<b>4-31</b>
<b>4.13</b>	<b>SAFETY CONCERNS</b>	<b>4-31</b>
<b>5.0</b>	<b>ENVIRONMENTAL CONSEQUENCES</b>	<b>5-1</b>

<b>5.1</b>	<b>LAND USE</b>	<b>5-1</b>
5.1.1	PROPOSED ACTION	5-1
5.1.2	NO-ACTION ALTERNATIVE	5-2
<b>5.2</b>	<b>AIR QUALITY</b>	<b>5-3</b>
5.2.1	PROPOSED ACTION	5-3
5.2.2	NO-ACTION ALTERNATIVE	5-3
<b>5.3</b>	<b>NOISE</b>	<b>5-4</b>
5.3.1	PROPOSED ACTION	5-4
5.3.2	NO-ACTION ALTERNATIVE	5-5
<b>5.4</b>	<b>GEOLOGY AND SOILS</b>	<b>5-5</b>
5.4.1	PROPOSED ACTION	5-5
5.4.2	NO-ACTION ALTERNATIVE	5-7
<b>5.5</b>	<b>WATER RESOURCES</b>	<b>5-8</b>
5.5.1	PROPOSED ACTION	5-8
5.5.2	NO-ACTION ALTERNATIVE	5-8
<b>5.6</b>	<b>BIOLOGICAL RESOURCES</b>	<b>5-9</b>
5.6.1	PROPOSED ACTION	5-9
5.6.2	NO-ACTION ALTERNATIVE	5-13
<b>5.7</b>	<b>CULTURAL RESOURCES</b>	<b>5-13</b>
5.7.1	PROPOSED ACTION	5-13
5.7.2	NO-ACTION ALTERNATIVE	5-15
<b>5.8</b>	<b>HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT</b>	<b>5-15</b>
5.8.1	PROPOSED ACTION	5-15
5.8.2	NO-ACTION ALTERNATIVE	5-16
<b>5.9</b>	<b>SOLID WASTE MANAGEMENT</b>	<b>5-16</b>
5.9.1	PROPOSED ACTION	5-16
5.9.2	NO-ACTION ALTERNATIVE	5-17
<b>5.10</b>	<b>SOCIOECONOMICS</b>	<b>5-17</b>
5.10.1	PROPOSED ACTION	5-17
5.10.2	NO-ACTION ALTERNATIVE	5-18
<b>5.11</b>	<b>SAFETY CONCERNS</b>	<b>5-18</b>
5.11.1	PROPOSED ACTION	5-18
5.11.2	NO-ACTION ALTERNATIVE	5-18

5.12	<i>IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES</i>	5-19
6.0	<i>CONSULTATION AND COORDINATION</i>	6-1
7.0	<i>LIST OF PREPARERS</i>	7-1
8.0	<i>REFERENCES</i>	8-1
9.0	<i>LIST OF ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE</i>	9-1
10.0	<i>AERIAL PHOTOGRAPHS</i>	10-1

## **LIST OF FIGURES**

2-1	<i>Location Map</i>	<i>following page 2-2</i>
2-2	<i>Proposed License Area and Training Locations</i>	<i>following page 2-2</i>
2-3	<i>Laser Firing Tank Range (Tullahoma PGST/ TWGST Range)</i>	<i>following page 2-2</i>
2-4	<i>Location of Laser Firing Tank Range and Artillery Maneuver Areas</i>	<i>following page 2-2</i>
2-5	<i>Aerial Photograph Key – Tullahoma Training Center</i>	<i>following page 2-2</i>
2-6	<i>Tank and Artillery Training Area</i>	<i>following page 2-2</i>
4-1	<i>Soil Series Map Proposed Training Areas</i>	<i>following page 4-9</i>
4-2	<i>Surface Drainage Proposed Training Areas</i>	<i>following page 4-10</i>
4-3	<i>Land Use Map Proposed Training Areas</i>	<i>following page 4-16</i>
4-4	<i>Wetlands Locations Proposed Training Areas</i>	<i>following page 4-19</i>
4-5	<i>Rare, Threatened, or Endangered Species and Sensitive Habitat Proposed Training Areas</i>	<i>following page 4-20</i>
4-6	<i>Eggert's Sunflower Proposed Training Areas</i>	<i>following page 4-20</i>
4-7	<i>Location of Eggert's Sunflower at Tank and Artillery Training Areas</i>	<i>following page 4-20</i>
4-8	<i>Cultural Resources Site Survey and Probability Status</i>	<i>following page 4-22</i>
4-9	<i>RFI SWMUs Proposed Training Areas</i>	<i>following page 4-26</i>



## **LIST OF TABLES**

4-1	<i>National and Tennessee Ambient Air Quality Standards</i>	<i>following page 4-4</i>
4-2	<i>Maximum Allowable Pollutant Concentration Increases Under Prevention of Significant Deterioration Regulations</i>	<i>following page 4-4</i>
4-3	<i>Ground Water Quality Monitoring at Proposed Training Sites</i>	<i>following page 4-14</i>
4-4	<i>Invasive Pest Plant Species at AAFB</i>	<i>following page 4-16</i>
4-5	<i>Rare, Threatened and Endangered Species</i>	<i>following page 4-20</i>
4-6	<i>Status of Recorded Cultural Resources Sites</i>	<i>following page 4-21</i>
5-1	<i>Estimated Annual Pollutant Emissions Resulting from the Proposed Action</i>	<i>following page 5-3</i>
5-2	<i>Emission Inventory for Point Sources</i>	<i>following page 5-3</i>

## *EXECUTIVE SUMMARY*

The National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations (CFR) 1500-1508, the National Guard Bureau regulation 32 CFR part 651, and Air Force Instruction (AFI) 32-7061 (32 CFR 989), which implement these laws and regulations, direct that the Air Force and National Guard consider environmental consequences when authorizing or approving major federal actions. This Environmental Assessment (EA) analyzes the potential environmental consequences of 154 acres within the proposed licensed 1,264 acres of land for the development of proposed new training areas, which would occur on Arnold Air Force Base (AFB) property south of the Tullahoma Training Site (TTS).

The Tennessee Army National Guard (TNARNG) has received funding and approval from the National Guard Bureau for the preparation of an EA to document the environmental effects of constructing a laser firing tank range and a six-station artillery maneuver area for the TNARNG “site” on a proposed 1,264 acres. This Proposed Action would be located on Air Force property and not part of the present 6,895 acres the TTS licensed to the state of Tennessee, TNARNG. The proposed new area is directly south of the existing 6,895 acres licensed to the TNARNG.

Presently, the 6,895-acre TTS includes gun ranges, a drop zone, and buffer areas. Due to the large area of land occupied as a safety zone to the east of the firing ranges, and present use of the remainder of the property, the area available for the additional training areas is inadequate.

The TNARNG needs the tank range and artillery maneuver areas to provide adequate training facilities for these operations to support the mobilization mission of the TNARNG. The development of these areas must be compatible with the short- and long-term plans of Arnold AFB. The proposed tank range and artillery maneuver areas would allow the TNARNG to continue and improve its stated mission.

The United States Air Force (USAF) is the owner of the proposed license property. The TNARNG will be requesting amendment of its current license at Arnold AFB, and the USAF, as installation host, is the lead agency in this NEPA process. Analysis of these proposed actions may result in a Finding of No Significant Impact (FONSI) or an Environmental Impact Statement (EIS) or selection of the No-Action alternative.

## **PROPOSED ACTIONS**

The TNARNG proposes to license approximately 1,264 acres on Arnold AFB property to develop a laser firing tank range and artillery maneuver areas. The proposed license area is directly south of the present 6,895-acre TTS. The tank range would include two existing roads used as mobile firing lanes, an observation tower, a 7-acre staging area, targets, and use of existing roads as connecting roads located in South Camp Forrest. A gravel staging area would be developed south of the observation tower south of Road 6 and east of Road F-1-S. The staging area would include a gravel lot for tank and vehicle parking and a metal catch pan for refueling.

The artillery maneuver area would include six, 5-acre plots that would be used to set up, simulate fire, and then dismantle artillery equipment. Each plot would be located adjacent to existing roads or with short connector roads. The roads connecting the maneuver areas would be improved as needed to support the heavy equipment traffic. The maneuver areas would be connected by 22,000 feet, approximately 4 miles, of existing road, which would allow the TNARNG to conduct higher-level training exercises more efficiently and cost-effectively. A 12-acre staging area would be developed for truck, artillery, and vehicle parking and refueling. The staging area for the artillery would be located between Roads 7 and 8 west of Road J-5-S.

## **ALTERNATIVES**

Alternatives were developed and reviewed for the Proposed Action. These alternatives included 1) the use of existing training areas at the TTS 2) the use of training areas at Fort Campbell and Fort Knox in Kentucky and 3) different configurations of the proposed tank training area and location of artillery training sites on the proposed license area.

The first alternative was to use the currently licensed 6,895-acre TTS site. This site is unacceptable due to the lack of available area for development of the proposed training activities without adversely affecting current activities. The TTS site also does not have the required road structure to accommodate the Proposed Action and indicates a greater occurrence of Eggert's sunflower (*Helianthus eggertii*), a federally listed threatened species.

The second alternative was to use the Fort Campbell and Fort Knox sites that are currently in use for live fire training. The live fire training takes priority over the simulated fire. The TNARNG units would not be able to schedule adequate simulated fire training and would not be able to achieve their mission of improved tank and artillery training. In addition,

the Fort Knox site would require an additional 2 hours travel time from Fort Campbell. Fort Campbell is north of Nashville (where weekend traffic is commonly congested) and 2 hours farther from Tullahoma than the guard units at Catoosa County, Georgia and Knoxville, Tennessee. For half of the units that are in need of the simulated training, this would add over 4 hours travel time.

The third alternative was to use the proposed license area with different training configurations than the preferred alternative. On the proposed license area south of the TTS, two options were considered for the configuration of the tank range. One option would expand activities beyond the Proposed Action to include use of relatively undisturbed trails, traces of trails, and fringe areas around these trails and roads for tank traffic. This option was not considered reasonable due to the increase in disturbance to natural resources and increased cost. A second option was considered that included the placement of tank targets on Arnold AFB Conservation Management Unit 7452 and in the dove hunting fields managed by the Tennessee Wildlife Resources Agency (TWRA). Management Unit 7452 was reported as habitat for Eggert's sunflower. The dove field is utilized annually by a large number of hunters. The tank target range and travel road would impact these areas. In addition, the staging area for the artillery area was 20 acres in size for this option and would negatively impact important natural resources. As a result, these two options (and therefore the third alternative) were eliminated from further analysis.

Two options were also considered for the artillery maneuver areas in the third alternative. Initially, only four maneuver areas were proposed at locations south of Wattendorf Memorial Highway. These locations were not connected by the present road system and this option would have resulted in the construction of new roads, the disturbance of natural resources (stream crossings), additional assessment, and increased cost. The second option for the artillery training sites was the development of six sites to provide improved opportunity for training of more units simultaneously and the transfer of locations to sites adjacent to existing roads. The Arnold AFB Conservation staff conducted a cursory review of these sites. It was determined that one site was likely to affect Eggert's sunflower, so these two options were dismissed as not reasonable due to additional road construction cost and negative impacts to a federally listed threatened species.

### ***NO-ACTION ALTERNATIVE***

Under the No-Action Alternative, the licensing of 1,264 acres of new land to the TNARNG and development of new training areas for expanded and

improved training capability would not be provided. The benefits of improved training capabilities would not be provided, and the TNARNG would not reduce the cost of training by the use of simulated fire compared to live fire or increase the amount of training time by use of a simulated fire range. The areas would remain in their present condition.

## ***ENVIRONMENTAL AND SOCIOECONOMIC ISSUES AND CONCERNS***

Environmental impacts of the Proposed Action include potential effects on geology and soils, air quality, biological resources, solid waste management, noise, land use, socio-economics, and safety concerns. Operational procedures would be in place to avoid sensitive areas and modify training activities such that no significant adverse effects would occur. These primarily include (1) field marking of sensitive areas to prohibit their use in training, and (2) adherence to the Arnold AFB management plans for conservation of natural resources. These procedures also include rotating maneuvers over available maneuver areas and repairing associated damage between heavy usages. Details of proposed operational procedures are found in Section 4.

## ***CONCLUSIONS***

The TNARNG proposes to license 1,264 acres of property (154 acres environmentally impacted) from Arnold AFB for development of a laser firing tank range and artillery maneuver training areas. The Proposed Action would enable the TNARNG to provide improved training facilities and a laser firing tank range, which it does not currently have. At present, the training ranges in at Campbell and Fort Knox are primarily live fire, which is a priority and prevents adequate simulated fire training. Alternatives reviewed would result in negative impacts to natural resources and additional cost. The Proposed Action would have a minimal negative impact on natural resources of the area and would provide the most cost-effective facilities required by the TNARNG to achieve their mission. Greater training efficiency would be provided by the use of simulated fire over live fire. Troops would train with simulated fire and become more proficient with their weapons prior to training with live fire. This would result in significant cost savings compared to the expense of live fire munitions and greater field proficiency prior to live fire maneuvers.

### *1.1 INTRODUCTION*

The National Environmental Policy Act (NEPA) requires that federal agencies consider and document the potential environmental effects associated with major federal actions conducted within the United States. Arnold Air Force Base (AFB) and the Tennessee Army National Guard (TNARNG) are federal agencies; therefore, they must comply with the requirements of NEPA, its implementing regulations, and other related statutes. This Environmental Assessment (EA) analyzes the potential environmental consequences of the military training activities that would occur upon development of a new Artillery Maneuver Area and Laser Firing Tank Range on 154 acres of a proposed 1,264-acre licensed property south of the Tullahoma Training Site (TTS) on Arnold AFB. Of the 1,264 acres, 154 acres could be environmentally important. Arnold AFB and the TNARNG consider environmental stewardship as an integral part of their missions.

Arnold AFB and the TNARNG are jointly preparing this EA to document and determine whether or not there are any significant environmental effects associated with creation of a laser firing tank range and a six-station artillery maneuver areas on the proposed site. This property is located on the Base and is not part of the 6,895 acres presently licensed to the TNARNG. The proposed laser firing tank range would be located between Arnold Center Road (Wattendorf Memorial Highway) and Road 8 of South Camp Forrest. The proposed areas are connected by a series of roads, which presently are gravel or dirt roads of varying quality. Some of these roads would be improved to support military training vehicles. The development of these areas would allow the TNARNG to perform training exercises more efficiently and cost-effectively, and would provide additional facilities for a higher level of training.

### *1.2 PURPOSE AND NEED*

The TNARNG proposes the licensing of 1,264 acres to construct a proposed laser firing tank range and artillery maneuver area on property south of the TTS. The proposed tank range would not use live ammunition. Tanks would sight on targets with lasers, and firing would be simulated. The proposed tank range would include firing lanes, a 7-acre staging area, observation tower, and targets on the Camp Forrest area south of the TTS. Existing roads would be utilized for this range;

however, an observation tower, staging area, and targets would be constructed. Roads would be improved as needed with the addition of gravel on the current footprint of the roads.

The proposed artillery maneuver area would consist of six 5-acre tracts located to the southeast of the proposed tank range and would be accessed from a 12-acre staging area. The proposed artillery maneuver areas are presently connected by existing gravel or dirt roads. These roads, approximately 4 miles in cumulative length, would be improved to support the heavy traffic of the artillery equipment, where needed. The proposed artillery maneuver areas have been selected based on their accessibility, proximity to the staging area, and low potential to impact environmentally sensitive areas. As part of the developed use of the property, Arnold AFB and the TNARNG have recommended that a formal EA be conducted to determine the impacts of proposed training activities on the areas.

The TNARNG needs the proposed tank range and artillery maneuver areas to provide adequate training facilities for these operations to support the mobilization mission of the TNARNG. The Proposed Action would provide improved training facilities for the following National Guard units:

- The 278th Armored Calvary Regiment, Knoxville TN, which has squadrons in Athens, Kingston, Knoxville, Cookeville, and Smyrna Tennessee
- The 196<sup>th</sup> Field Artillery Brigade of Chattanooga, which has four battalions: Winchester, Chattanooga, Henderson, and Memphis, Tennessee

The Proposed Action is needed to provide improved training for the above units for a number of reasons, which include:

- Crews would have more time to train rather than travel. Currently it takes an average of 8 hours for crews to travel from unit armories in Tennessee to Fort Campbell and Fort Knox in Kentucky. Implementation of the Proposed Action would shorten this travel time to 2 to 4 hours.
- The current training sites only allow live fire. Scheduling of laser fire at Fort Campbell and Fort Knox is low priority. The Proposed Action would give crews access to laser fire. Laser fire enables crews to become more proficient and accurate with hitting the intended targets, thereby improving skills and lowering ammunition costs.
- The Proposed Action would provide one centralized range that can be used by all units. This is the most efficient means to provide the



training required because active duty units use Fort Knox and Fort Campbell and reserve units do not have adequate access.

- Range automation equipment is expensive to purchase and maintain. These costs can be reduced by construction of one centralized range. Current National Guard ranges do not provide for the level of training required and would have to upgrade individually to achieve the training level needed.

The development of these areas must be compatible with the short- and long-term plans of Arnold AFB. The proposed tank range and artillery maneuver areas would allow the TNARNG to continue and improve its stated mission.

### **1.3                    *SCOPE OF THE ENVIRONMENTAL ASSESSMENT***

Environmental analysis of Army Action (32 Code of Federal Regulations [CFR] Part 651) and Air Force regulation 32 CFR 989, Environmental Impact Analysis Process, requires the Air Force and National Guard to analyze the environmental consequences of this Proposed Action. The United States Air Force (USAF) is the owner of the proposed license property. The TNARNG is requesting an amendment to its current license at Arnold AFB, and the USAF, as installation host, would be the lead agency in this NEPA process. The objective of this EA is to provide decision-makers with the information necessary to reach a Finding of No Significant Impact (FONSI) or to determine the need for an Environmental Impact Statement (EIS) prior to implementation of the Proposed Action or alternatives. Consistent with 32 CFR 989 and Council on Environmental Quality (CEQ) regulations, the scope of this EA was defined by the range of potential environmental impacts that could result from implementation of the Proposed Action and the No-Action Alternative. Several alternatives were eliminated from further analysis due to adverse impacts to the environment or increased cost of road construction. The following elements of the natural and human environments have been analyzed: geology and soils, water resources, air quality, biological resources, cultural resources, noise, transportation, hazardous materials and waste management, solid waste management, land use, socio-economics, and safety concerns. Because the Proposed Action and alternatives do not have the potential to significantly affect community employment, population, and infrastructure, these issues were eliminated from evaluation have not been analyzed in this document.

## 2.1 INTRODUCTION

NEPA, the CEQ regulations implementing NEPA (40 CFR 1500-1508), National Guard Bureau regulation 32 CFR part 651, and AFI 32-7061 (32 CFR 989), which implement these laws and regulation, direct that the Air Force consider environmental consequences when authorizing or approving major federal action. This EA analyzes the potential environmental consequences of the proposed licensing of 1,264 acres on Arnold AFB and the development of new training areas south of the TTS to the Tennessee Military Department (TMD).

The TNARNG proposes to develop a laser firing tank range and artillery maneuver areas on Arnold AFB property south of the present TTS. The tank range would include two 5,900-foot firing lanes (on existing roads), approximately 25 targets, an observation tower, 7-acre staging area, and 10,000 feet of existing roads (4.6 acres) utilized to return from the training run to the staging area. The area used for the target area would be managed for line of sight from the observation tower. The observation tower would be located on the west side of the tank range and would be approximately 50 to 60 feet tall. A total of approximately 90 acres of land are proposed for management of vegetation to a height no greater than 3 feet and the placement of targets. The total area that may be impacted by the proposed tank training area is approximately 102 acres.

The artillery maneuver area would include six 5-acre plots, a 12-acre staging area, and 22,000 feet of road (16 to 20 feet wide, approximately 10 acres). The total area potentially impacted by the artillery training area would be approximately 52 acres. Of the 52 acres, 42 acres would be hard surface and 10 acres would consist of existing roads. Each plot would be located adjacent to existing roads or with short connector roads. The roads connecting the maneuver areas would be improved as needed to support the military training vehicles. The maneuver areas would allow the TNARNG to conduct higher-level training exercises more efficiently and cost-effectively.

The total area impacted by the two proposed training areas is 154 acres. Of the 154 acres, there would be 30 acres in the five artillery maneuver sites, 19 acres of gravel pad used for the two staging areas, 90 acres managed for 3-foot high vegetation (including a hard surface area for the tower [0.5 acre] and 1.0 acre of low vegetation for targets), and 14.1 acres of existing road. Approximately 11.1 acres of road would need

improvement, 4.1 acres of road (9,000 feet) in the tank training area and 7.0 acres of road (15,300 feet) in the artillery training area. Road improvement would be done on the current road footprint.

The proposed intended use of the training areas includes approximately two to four weekends per year for the artillery brigade and four to eight weekends per year for the tank units. This would result in an anticipated average usage of 6 to 12 weekends per year.

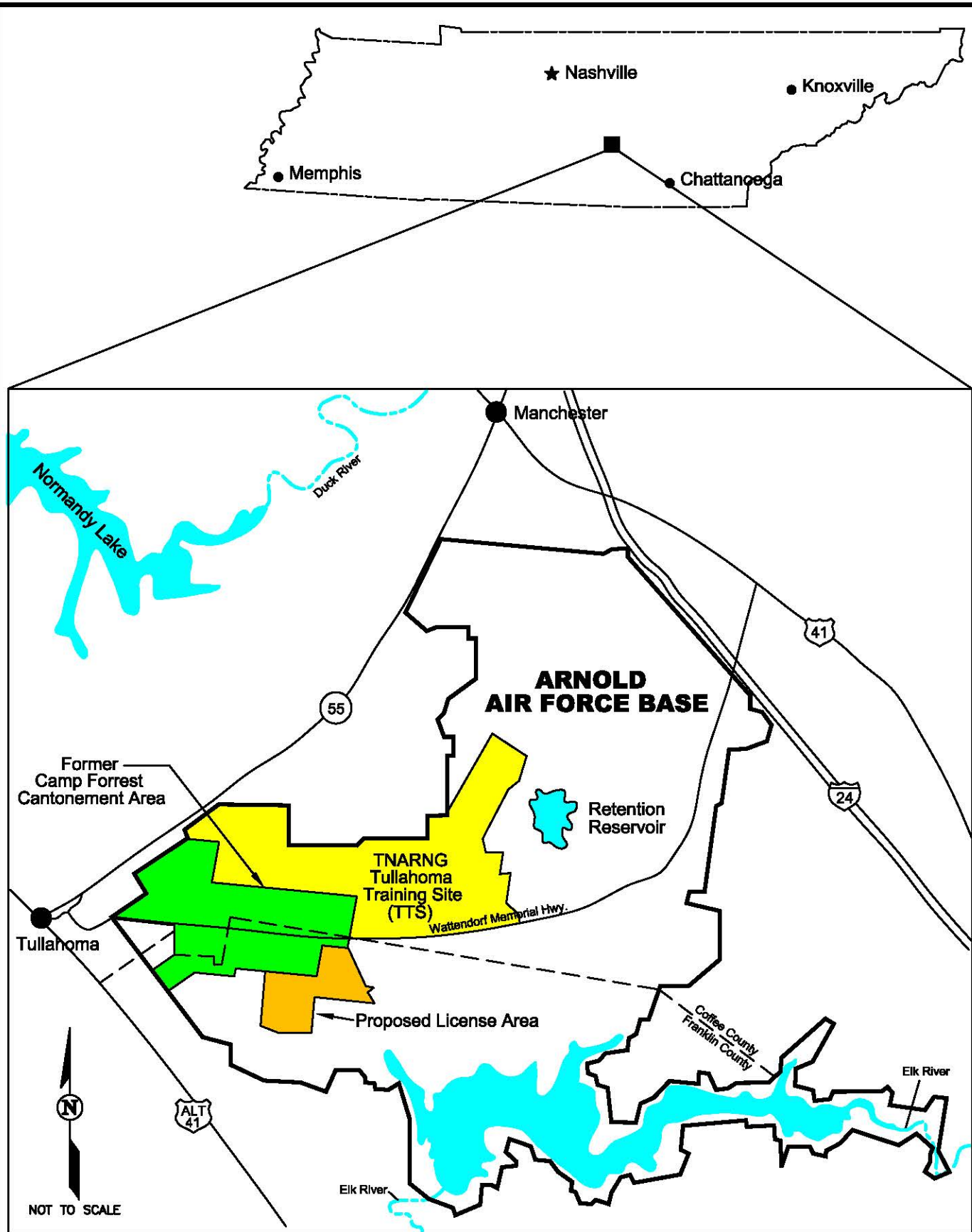
## **2.2                    *DETAILED DESCRIPTION OF THE PROPOSED ACTION***

The state of Tennessee, TNARNG proposes to license approximately 1,264 additional acres from the USAF for the purpose of constructing a laser firing tank range and artillery maneuver areas at Arnold AFB. The total area (102 acres) that would be utilized for the tank training activities would be located south of Wattendorf Memorial Highway in the South Camp Forrest area. The artillery maneuver areas (52 acres) would be located on six 5-acre plots along approximately 22,000 feet of road southeast of the tank range.

Figure 2-1 depicts the location of Arnold AFB in Tennessee, which includes the TTS and the proposed 1,264-acre license area. A more detailed map depicting both the proposed tank range and artillery maneuver areas is provided on Figure 2-2. The tank range and targets are shown on Figure 2-3, while the locations of the artillery maneuver areas are depicted in more detail in Figure 2-4. Figure 2-5 indicates the location of aerial photographs taken on 25 March 2002. The aerial photographs that cover the proposed tank training area are combined in Figure 2-6 and illustrate the current (25 March 2002) land use of the area. The aerial photographs identified in Figure 2-6 are presented in Section 10.

The tank range would include the firing lanes, targets, access roads, an observation tower, and a 7-acre staging area. The two firing lanes would be approximately 5,900 feet in length. These lanes would be on Roads 5 and 6 and extend from Road F-1-S to J-2-S. Tanks would travel one-way to the east on Roads 5 and 6, turn south on J-2-S while training, and return on Road 7. The turnaround on Road J-2-S would be enlarged to accommodate tank traffic. Approximately 25 targets would be constructed between and adjacent to these two roads such that tanks can simulate fire to both the left and right. The laser system is referred to as the Tank Weapons Gunnery Simulation System/Precision Gunnery System (TWGSS/PGS).

The TWGSS/PGS is an appended, laser based, precision gunnery and tactical engagement simulation trainer. The TWGSS/PGS allows on-

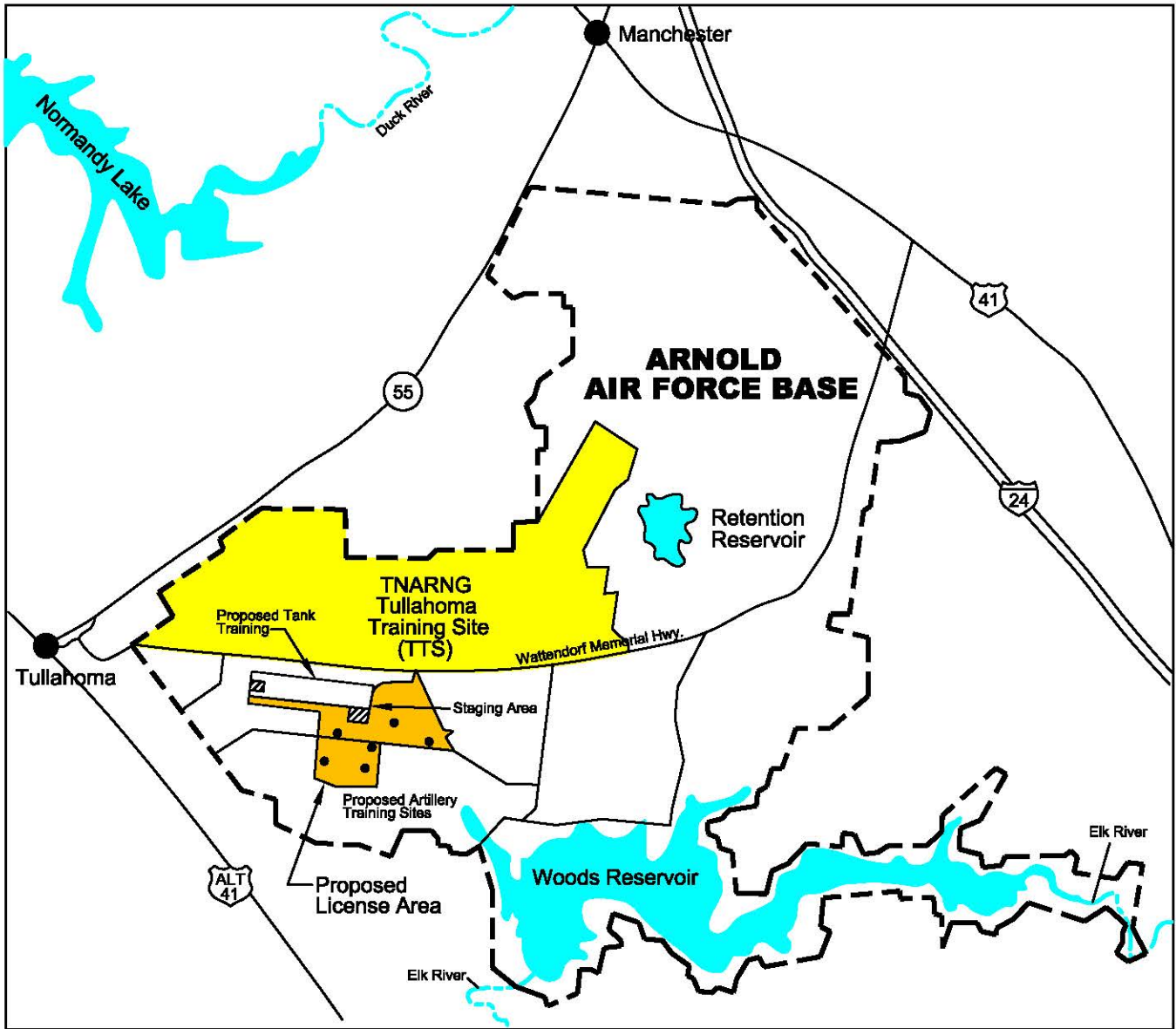


**Environmental  
Resources  
ERM Management**

**ARNOLD AIR FORCE BASE  
LOCATION MAP  
TNARNG  
TULLAHOMA, TENNESSEE**

**FIGURE**

**2-1**



NOT TO SCALE



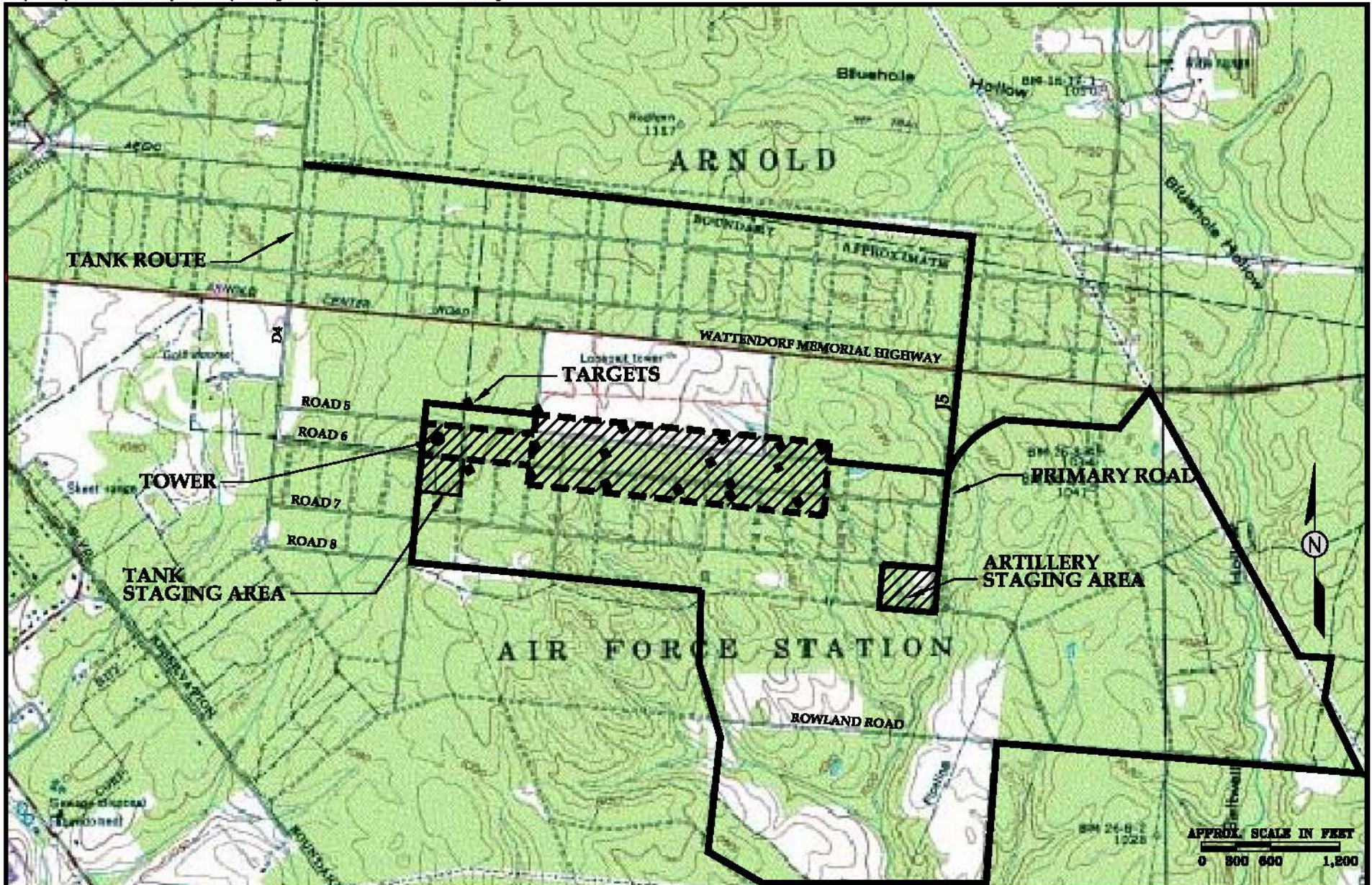
**Environmental  
Resources  
ERM Management**

**PROPOSED LICENSE AREA  
AND TRAINING LOCATIONS  
AAFB  
TULLAHOMA, TENNESSEE**

**FIGURE**

**2-2**





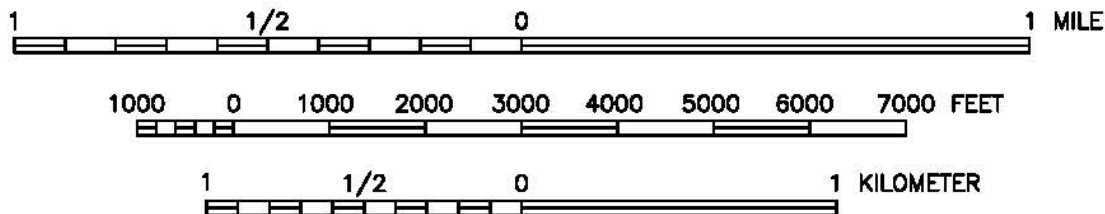
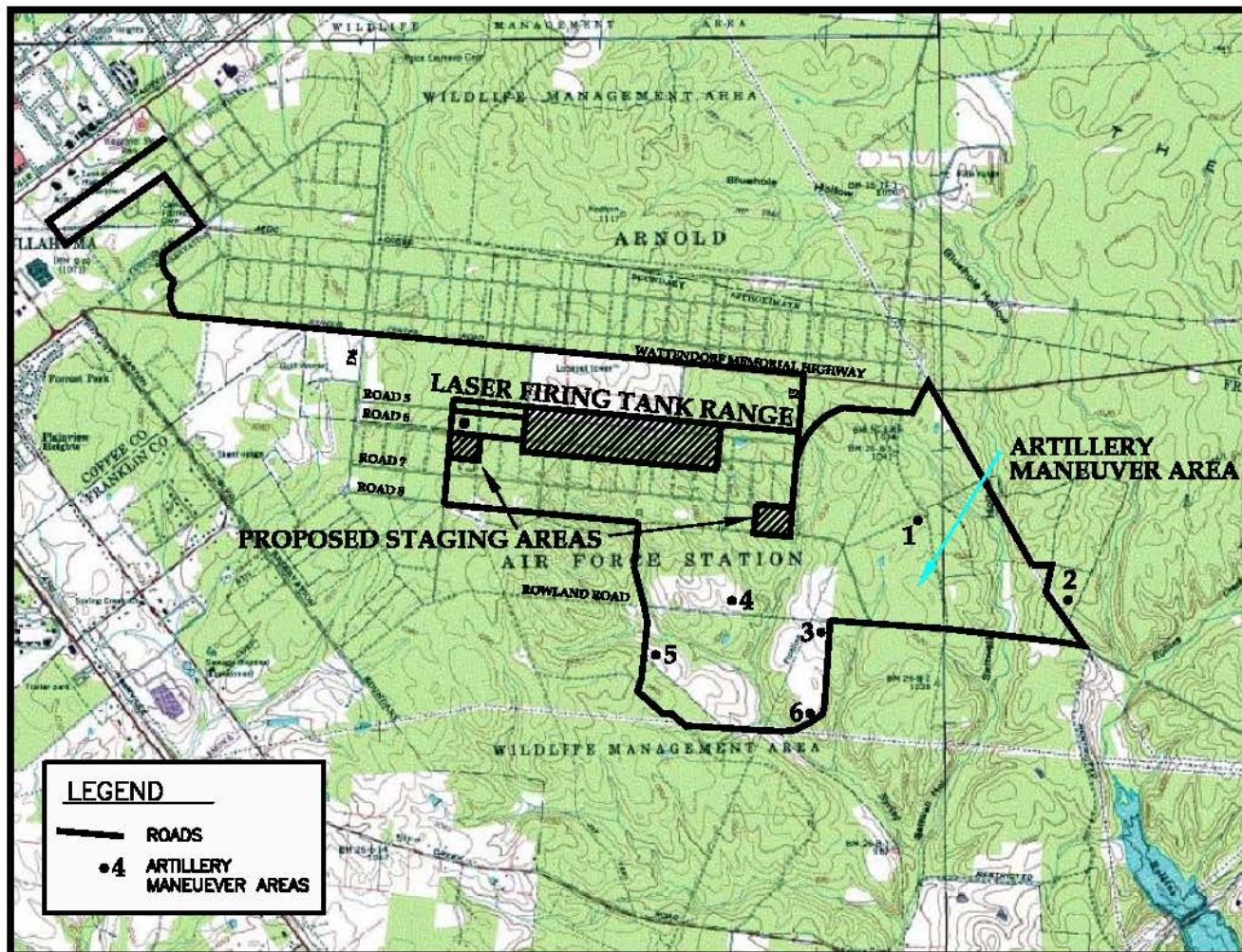
**URS**  
Franklin, Tennessee

**LASER FIRING TANK RANGE  
(TULLAHOMA PGST/TWGST RANGE)  
TNARNG  
TULLAHOMA, TENNESSEE**

FIGURE

**2-3**





SCALE 1:24000



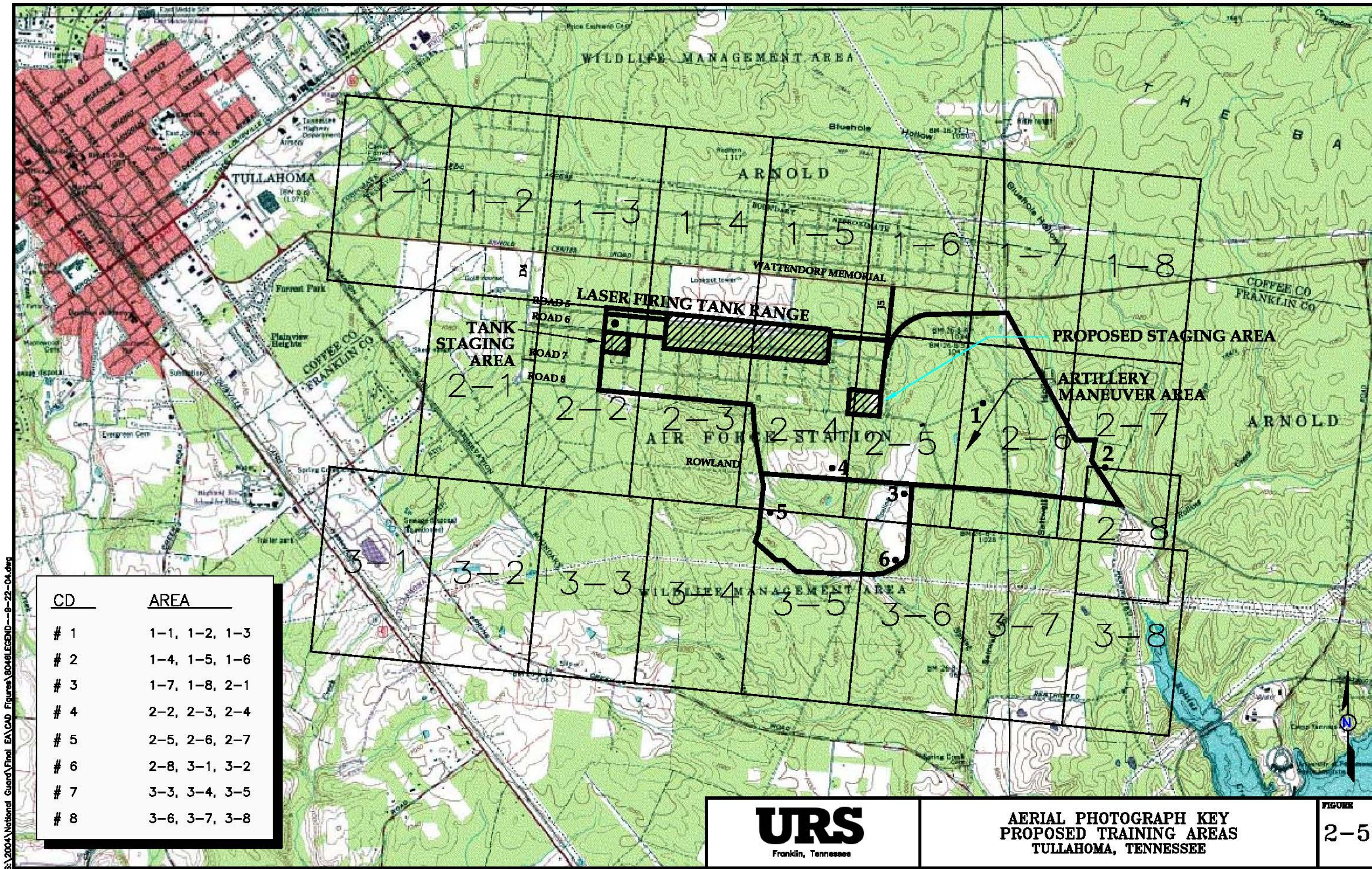
**URS**  
Franklin, Tennessee

**LOCATION OF LASER FIRING TANK  
RANGE AND ARTILLERY MANEUVER AREAS  
TNARNG  
TULLAHOMA, TENNESSEE**

**FIGURE  
2-4**



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CD	AREA
# 1	1-1, 1-2, 1-3
# 2	1-4, 1-5, 1-6
# 3	1-7, 1-8, 2-1
# 4	2-2, 2-3, 2-4
# 5	2-5, 2-6, 2-7
# 6	2-8, 3-1, 3-2
# 7	3-3, 3-4, 3-5
# 8	3-6, 3-7, 3-8



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vehicle precision gunnery without the expenditure of actual ammunition. Both TWGSS/PGS are fully integrated with the vehicle fire control system, requiring the crew to perform gunnery functions exactly as they would in combat. The TWGSS/PGS provide visual tracers, burst, and obscuration through the vehicle sights. All event data are recorded for display on a notebook computer for after-action review training. The TWGSS/PGS are non-harmful to human vision or wildlife.

Targets constructed adjacent to the roads would be within 100 feet north of Road 5 and 100 feet south of Road 6. The area within this target range would be cleared of timber and maintained for line of sight from the observation tower and tanks. Maintenance of the cleared area would be done in coordination with Arnold AFB Management Plans to minimize impacts to natural resources. The line of sight required from the tanks to the targets is approximately 3 feet. The vegetation would be maintained to a maximum height of 3 feet throughout the target field. Access roads to the targets for servicing would also be maintained. Targets would be powered by battery, with generator back up, and controlled remotely from the tower.

Targets would have a footprint of 15x15 feet and would be set into the ground approximately 3 feet. The targets would have a 10-foot wide path around them for maintenance purposes. Access roads to and around each target would be mowed by bush-hog or other means coordinated with Arnold AFB. With each target area approximately 35 feet in diameter, each would occupy approximately 1,225 square feet. Twenty-five targets would cover approximately 0.7 acre. It is assumed that the access roads to each target would increase the total impacted area for targets to approximately 1.0 acre. This 1-acre area impacted by targets is within the 90 acres managed for the target area.

Improvement of Road 5 is not anticipated for the tank training, as it is constructed of concrete; however, Road 6 is gravel and would require additional reinforcement. Reinforcement would be done with additional gravel. The tanks would simulate fire from mobile or stationary positions on the existing roads. The project would include construction of targets that would be approximately 10 feet tall. The location of the targets would be coordinated with the Base to minimize impacts to natural resources. Targets would be placed in presently open areas where possible. An observation tower would be constructed at the start of the training area just east of Road F-1-S and between Roads 5 and 6. The tower would be approximately 50 to 60 feet tall, depending on the elevation required to view the entire target area. The tower would be supported by steel beams at the four corners, with a 60-foot diameter hard surface footprint. An additional 40-foot gravel access road would encircle the tower for vehicular parking and access, for a total footprint of

approximately 140 feet diameter (0.35 acre). The tower would require electric power, which is available from Road 5. Targets would be remotely operated from the tower and would not require electrical connection to the tower. Water and wastewater management would be supplied on a temporary basis during training by bottled water and port-a-johns. A 7-acre staging area would be constructed south of the tower, south of Road 6. The staging area would be cleared, graveled, and used for staging and fueling of tanks prior to each training run. Fueling would be done with fuel trucks operated over metal fueling pads. Each pad would include a 6-inch wall to contain potential releases.

The TNARNG has a total of four tank squadrons, each consisting of a Bradley gunnery and an M1 tank gunnery. Training for a squadron would be conducted over multiple weekends. Bradley gunneries (4), consisting of six Bradley tanks and six High-Mobility Multipurpose Wheeled Vehicles (HMMWVs), would operate over four weekends annually and would include approximately 280 soldiers per weekend. M1 tank gunneries (4), consisting of six M1 tanks and six HMMWVs, would operate over the same four weekends annually and would include approximately 200 soldiers per weekend. Thus, the tank training area would be utilized approximately four times each year. The training schedule would begin in November and extend through February. It is anticipated that training would include two weekends in November, one weekend in January, and one in February with a total of approximately 480 soldiers per weekend.

An advance party of 5 to 10 soldiers would arrive each Friday and position the required equipment at the staging area, in accordance with applicable Military Training Procedures (MTPs) and safety regulations. Advance party personnel would assist Range Control in setting up the range in the proper configuration. Tank/Bradley crews would perform lanes training as prescribed by the applicable MTP. Equipment would remain in place until Sunday, when it would be returned to the training site Motor Vehicle Storage Area (MVSA).

Figure 2-2 and 2-6 show the six proposed artillery maneuver areas and the connecting roads. The main road that would be traveled by artillery equipment is Rowland Road, which runs east and west, south of the tank training area. Each maneuver area would be cleared to provide for 18 artillery units (approximately 5 acres). The maneuver areas would include open fields where up to 18 artillery units can be assembled at one time. During training, six artillery units would generally be assembled at any one time at each site. Each unit would be assembled, simulate firing, and disassembled for transport to the next area. The maneuver areas would have gravel roads leading to each location off of the established roads. Since existing roads would connect the maneuver areas, additional

development of the roads is anticipated to be minimal. Gravel would be added as needed to the existing roads to support the vehicular traffic and reduce potential erosion and sedimentation damage. Artillery units would travel between training areas by specific routes. The travel would be in a one-way direction leading from the staging area and returning to the staging area. The roads would be enhanced by the addition of gravel to support the artillery traffic. Because of the one-way traffic, the footprint of the roads would not be increased.

The TNARNG proposes to create an artillery maneuver area for the 196<sup>th</sup> Field Artillery Brigade (Bde) to conduct preliminary gunnery exercises using non-firing training devices during typical training assembly of artillery units. The 196<sup>th</sup> Bde utilizes towed 155mm howitzers pulled behind 5-ton Family of Medium Tactical Vehicles (FMTV) trucks. The scenarios require that the crews move between various positioning areas along a specified route. At each positioning area, units are required to set up their artillery pieces and simulate indirect fire engagements of fictional targets. The crews then disassemble the equipment and move to the next position and set up and simulate fire again until their mission is complete. Approximately 18 towed artillery pieces and 60 HMMWVs would be involved in the artillery training each weekend. Artillery training would be conducted approximately two to four weekends per year, primarily during late April and in early June. Units would move to various positioning areas in groups of four to eight towed artillery pieces and support vehicles. Approximately 4 miles of gravel roads would be utilized between the six locations. Of these 4 miles of road, approximately 3,500 feet are two lanes of gravel, including Road J5 and Rowland Road east of J5. Approximately 600 feet of the route is dirt road located between artillery site 5 and 6. The remainder of the route is gravel road approximately 16 feet wide. Some of the present roads would need improvement to support the vehicles and prevent erosion. Gravel would be added to support the training vehicles as needed and would be placed on the current footprint of the roads. The dirt road section between artillery sites 5 and 6 would be graveled. This is currently an upland area. A total of approximately 475 soldiers would be involved during the artillery training weekends.

### **3.1                    *ALTERNATIVES DEVELOPMENT***

Arnold AFB and the TNARNG evaluated the Proposed Action and the No-Action Alternative and eliminated from further analysis three other alternatives. The three alternatives eliminated included:

1. Use of the 6,895-acre TTS for the tank range and artillery maneuver areas
2. Use of the South Camp Forrest area, with configurations different from the Proposed Action
3. Use of two established bases, Fort Campbell and Fort Knox.

### **3.2                    *ALTERNATIVES ELIMINATED FROM FURTHER ANALYSIS***

#### **3.2.1                *Use of TTS***

At present, the TTS does not have a location where tanks can simulate fire at targets. The primary development of the proposed tank range would involve the construction of the roads, targets, and firing positions. Road construction would not be required at the proposed site, but would be required at the TTS. The Proposed Action for the tank range was based on the existence of adequate roads at the Camp Forrest location and open land where targets can be placed without extensive clearing of vegetation to provide line of site for tank laser-fire training. The site lacks an adequate road network, involves training uses that limit the available area (live fire rifle ranges and drop zone), and includes a greater coverage of Eggert's sunflower (*Helianthus eggertii*), according to Arnold AFB Geographic Information System (GIS) mapping. These considerations eliminated the TTS from further analysis.

#### **3.2.2                *Alternative Uses, South Camp Forrest Area***

##### **3.2.2.1            *Alternative Configurations to the Proposed Tank Training in the Proposed Alternative Training Area***

Under this alternative, activities would be expanded beyond the Proposed Action to include use of relatively undisturbed trails, traces of trails, and

fringe areas around these trails and roads for tank traffic. The proposed target range in Management Unit (MU) 7452 was a recent clear cut that is reported as Eggert's sunflower habitat. New roads would result in grading of forested areas, agricultural fields/food plots, Eggert's sunflower habitat, and previously undisturbed habitat. A greater amount of the area presently proposed for use in the tank range would be subject to tank traffic, additional roads would have to be reinforced, and firing lanes would have to be cleared. Training is proposed for approximately 15 weekends per year, thus overlapping the movement of sensitive species, hunting seasons, and other uses. Based on the impacts discussed above, this alternative was eliminated from further analysis.

### 3.2.2.2 *Alternatives for the Artillery Maneuver Areas South of the Proposed Alternative Training Area*

A number of alternative locations on the Base were reviewed for the proposed artillery maneuver areas. TNARNG and Air Force personnel screened these areas in the field to select locations where the least impact to natural resources would occur. Three areas for artillery maneuver scenarios were evaluated. Area 1 includes four assembly areas randomly selected to the south of the proposed tank range. New roads would be required to connect these locations and the environmental effects of creating each area are unknown. Area 2 includes six locations closer to the tank range and staging area. Those locations are more accessible by the present road system; however, two of the locations would require construction of additional gravel roadway and one is located near a known endangered plant community, based on field review. In Area 3, the six locations were spread out, but were all directly accessible by the present road system. While all locations were accessible, location number 2 was in the floodplain of a creek in Saltwell Hollow. Location 2 was moved to higher and more open ground to result in the selection of maneuver areas in the Proposed Action. Areas 1, 2, and 3 also included the use of 15 to 20 weekends per year, resulting in conflicts with sensitive species, hunting seasons, and other uses. As a result, this alternative was eliminated from further analysis.

### 3.2.3 *USE OF FORT CAMPBELL OR FORT KNOX Alternative*

The use of established bases for the needed training was considered. The two bases where the TNARNG currently performs some of their training include Fort Campbell and Fort Knox in Kentucky. Fort Campbell is located north of Nashville and all travel to the fort would require transportation of heavy equipment through Nashville on weekends, when heavy highway use occurs for entertainment and sporting events. This travel constraint plus the location 2 hours north of Nashville would increase the travel time from TNARNG bases by 2 to 4 hours. More



importantly, the commander at Fort Campbell is required to utilize the range for active troops in preference to reserve troops such as the Guard. In addition, Fort Campbell does not have the armor (M1's or Bradleys) for use in training and the TNARNG would be required to transport all equipment to and from the site. The TNARNG would not be allowed to schedule training on a regular basis due to the Air Assault Commands range use priority. No staging areas are dedicated to reserve components to set up an operations headquarters, and the housing is very limited due to the active components.

At Fort Knox, the same issues exist as at Fort Campbell, with the additional constraints of no simulated fire range, live fire only, additional travel time of at least 2 hours, and no ability to establish a schedule because of the priority use by active units. Therefore, this alternative was eliminated from further analysis.

### 3.3

#### *NO ACTION ALTERNATIVE*

In the No-Action Alternative, no laser firing tank range and artillery maneuver areas would be established, and the TNARNG would not lease 1,264 acres from the Air Force. The TNARNG would not have the training facilities to prepare for higher-level defensive maneuvers of simulated fire on targets, as well as assembling and operating artillery equipment. The TNARNG would, therefore, not meet the requirements of its mission of being prepared for combat. The armored brigades would continue to travel 2 to 4 additional hours to receive their training, increasing the cost of mobilization and reducing the time spent on training; in addition, training could not be scheduled when best for the Guard. Training at established forts would continue to be preempted because of the need to train active units.

The description of the affected environment identifies the existing environmental conditions at the proposed tank training area and artillery maneuver areas, which are located south of the TTS on Base property. The total area of developed property included in the Proposed Action is approximately 49 acres of hard surface land plus the 14.1 acres (22,000 linear feet) of connecting roadway, and 90 acres of land cleared or maintained for line of sight observation and targeting. The Proposed Action would be located within the 1,264 acres proposed for licensing. The area affected would be limited to the 154 acres including 22,000 feet of road involved in the tank range and artillery training areas. The remaining land within the 1,264-acre license area would act as a buffer zone. No TNARNG activities within the buffer zone area are planned at this time. This description provides the baseline information that was used to identify and evaluate potential environmental impacts resulting from the development of the tank and artillery training areas. This section focuses on those environmental resources that are likely to be affected by the activities of the TNARNG at the training areas. These resources include geology and soils, water resources, air quality, biological resources, cultural resources, noise, hazardous materials and waste management, solid waste management, land use, socio-economics, and safety concerns.

#### **4.1**                    *LOCATION DESCRIPTION*

The proposed license area is located in southern middle Tennessee in Coffee and Franklin Counties within the 39,081-acre Arnold AFB. The majority of the 1,264 acres is in northern Franklin County on the west side of the Base, south of Wattendorf Memorial Highway. The property lies approximately 2 miles east of the city of Tullahoma and is located north of Woods Reservoir, which is part of the Base. The proposed affected area within the license property includes the tank training area on South Camp Forrest, as well as artillery training areas located south and southeast of South Camp Forrest.

The primary activities on the proposed site would be wildlife management, forest management, natural resources management, and Installation Restoration. The 1,264-acre license area is included in the 39,000 acres at the Base used as wildlife management by the Tennessee Wildlife Resources Agency (TWRA). A 92-acre food plot is located north of the proposed tank training area.

The general landscape of the proposed license area includes the remnants of South Camp Forrest, which is pine forest in various stages of growth, hardwood stands, and open fields. The topography is gently rolling.

The climate of the area is classified as warm, humid, and continental. The climate is largely responsive to the movement of low- and high-pressure systems across Tennessee. The low-pressure areas are attended by warm, moist, tropical Gulf air and by rains over the entire state.

In winter, the low-pressure areas are well developed and are frequently followed by high-pressure areas with polar Canadian air on their front, bringing clear, cold weather. In summer, the low-pressure areas are less active, but tropical maritime air moves inland and many thunderstorms develop. High-pressure areas produce morning surface inversions. The surface inversions occur about 35 percent of the time during the winter and 40 percent of the time during the summer.

Annual precipitation measured at Tullahoma is about 56 inches. Annual snowfall is about 10 inches. Average monthly precipitation ranges from 3 to 6 inches, with the minimum amount occurring in the autumn. There are about 87 days a year with precipitation amounts of 0.10 inch or more.

The average annual temperature is 59°F. July and August are the warmest months, with average maximum temperatures of 88°F and average minimum temperatures of 65°F. January is the coldest month, with an average maximum temperature of 49°F and an average minimum temperature of 29°F. Historical extreme temperatures range from 106°F to -14°.

Relative humidity is rather high, ranging on average from 60 percent in the afternoon to 85 percent in the morning.

The prevailing annual wind direction is south-southeast. The average annual wind speed is about 8 miles per hour.

## **4.2 LAND USE**

### **4.2.1 *Arnold AFB General Plan***

The Arnold AFB General Plan, adopted in 2003, is a working document that summarizes the current state of the Arnold Engineering Development Center's (AEDC) facilities, as well as natural and cultural environments, and provides a structure to facilitate resource management and decision-making. The plan is the primary tool used in all land use decisions and facility sitings. Four component plans provide the narrative discussion and graphic illustration for developing the considerations and

recommendations of the Arnold AFB General Plan: the Composite Constraints and Opportunities Plan, Infrastructure Plan, Land Use and Transportation Plan, and Capital Improvements Program Component. The Composite Constraints and Opportunities Plan integrates natural and cultural resources information, environmental quality issues, airspace restrictions, and operational and safety requirements with other issues that could influence planning decisions. The Infrastructure Plan consolidates all utility delivery systems and infrastructure investments into one source to provide a concise overview of the state of these systems throughout the installation. The Land Use and Transportation Plan analyzes and identifies the functional relationships among all activities that occur on the installation. It defines the process used in arriving at future land use determinations by analyzing planning factors that influence land use compatibility. The Capital Improvements Program Component integrates into one document all the primary elements of traditional physical planning, current land use, vicinity land use, existing base layout and facilities, existing transportation systems, and each of the corresponding future plans. The Land Use and Transportation Plan identifies the current 6,300-acre TTS as licensed to the state of Tennessee, TNARNG.

#### **4.2.2**      *Land Use at the Proposed Training Areas*

Present activities at the proposed training areas are confined primarily to forestland management and wildlife management (small and large game hunting), with roads designated for use as bicycle and hiking trails. The area is managed under principles of ecosystem management. Military facilities are shared by Department of Defense (DOD) and state and local governments, together with renewable and nonrenewable resource management including, but not limited to, recreation, timber, range, prime farmland, watershed, aquatic and wildlife, Threatened and Endangered Species areas, barrens habitat areas, and natural, scientific, and historic resources.

The proposed tank training area is primarily managed as pine plantation and wildlife habitat. Other management within the proposed license area includes the management of habitat for Eggert's sunflower, barrens habitat, hunting, biking, and hiking areas, and one cultural resource historic site.

#### **4.2.3**      *Off-site Land Use*

Off-site land uses include a city park, a historic municipal cemetery, a golf course, and an industrial business park, which surrounds the motor pool and cantonment areas of the TTS to the north of the proposed training areas. Off-site land use also includes the present training areas of the TTS

to the north of the proposed training area. The high-density residential areas of the city of Tullahoma are approximately 3 miles from the western boundary of the proposed training area. An industrial/commercial area, including a fireworks store, high-density mobile home park, and church, is adjacent to the northwest boundary of the TTS. Low-density residential areas are also located north of the maneuver area and rifle range and west of the Arnold AFB airfield. The airfield runway is approximately 2,500 feet east of the closest residence. The land north of the maneuver area and rifle range, and west of the Arnold AFB airfield, includes cultivated land, cattle pasture, pine plantation, and hardwood forest. South and east of the proposed training areas are Arnold AFB lands that are used for timber, range, aquatic and wildlife habitat, and natural, scientific, and historic resources.

### 4.3 *AIR QUALITY*

The pollutant emissions from sources and atmospheric interactions determine the quality of air. Information regarding the location and nature of all significant emission sources is important in ascertaining the air quality of an area.

#### 4.3.1 *Ambient Air Quality*

##### 4.3.1.1 *Ambient Pollutant Concentrations*

The significance of pollutant concentrations is determined by comparing the concentrations with an appropriate federal and/or state ambient air quality standard. Such standards have been established for ozone (O<sub>3</sub>), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), particulate matter less than 10 micrometers in diameter (PM<sub>10</sub>), lead (Pb), and fluorides. The Tennessee and National Ambient Air Quality Standards (NAAQS) are presented in Table 4-1.

The U.S. Environmental Protection Agency (EPA) has granted the Tennessee Division of Air Pollution Control the authority to implement regulations to prevent the significant deterioration of air quality in areas that are classified as attainment or unclassifiable. The Prevention of Significant Deterioration (PSD) program is implemented in large part through the use of "increments" and area classifications that effectively define "significant deterioration" for individual pollutants. The Clean Air Act's area classification scheme for PSD establishes three classes of geographic areas and applies increments of different stringency to each class. Air quality impacts, in combination with other PSD sources in the area, must not exceed the maximum allowable incremental increases presented in Table 4-2.

**Table 4-1     National <sup>1</sup> and Tennessee <sup>1</sup> Ambient Air Quality Standards  
Arnold Air Force Base, Tullahoma, Tennessee**

Pollutant	Averaging Time	Concentration <sup>2</sup>	
		Primary <sup>3</sup>	Secondary <sup>4</sup>
Ozone	8 Hour	0.08 ppm (157 µg/m <sup>3</sup> )	Same as Primary Std.
Carbon Monoxide	8 Hour	9 ppm (10 mg/m <sup>3</sup> )	--
	1 Hour	35 ppm (40 mg/m <sup>3</sup> )	--
Nitrogen Dioxide	Annual Average	0.053 ppm (100 mg/m <sup>3</sup> )	Same as Primary Std.
Sulfur Dioxide	Annual Average	80 µg/m <sup>3</sup> (0.03 ppm)	--
	24 Hour	365 µg/m <sup>3</sup> (0.14 ppm)	--
	3 Hour	--	1,300 µg/m <sup>3</sup> (0.5 ppm)
	1 Hour	--	--
	24 Hour	150 µg/m <sup>3</sup>	Same as Primary Std.
Particulate Matter (PM <sub>10</sub> )	Annual Arithmetic Mean	50 µg/m <sup>3</sup>	
Lead	30-Day Average	--	--
	Calendar Quarter	1.5 µg/m <sup>3</sup>	Same as Primary Std.
Fluoride <sup>5</sup>	12 Hour	3.7 µg/m <sup>3</sup>	
	24 Hour	2.9 µg/m <sup>3</sup>	
	7 Day	1.6 µg/m <sup>3</sup>	
	30 Day	1.2 µg/m <sup>3</sup>	

<sup>1</sup> National and Tennessee standards, other than ozone and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

<sup>2</sup> Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 millimeters of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 millimeters of mercury (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

<sup>3</sup> National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the EPA.

<sup>4</sup> National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the implementation plan is approved by the EPA.

<sup>5</sup> Tennessee standard. Not a NAAQS.

**Table 4-2**     *Maximum Allowable Pollutant Concentration Increases Under Prevention of Significant Deterioration Regulations  
Arnold Air Force Base, Tullahoma, Tennessee*

<b>Pollutant</b>	<b>Averaging Time</b>	<b>Maximum Allowable Increment (<math>\mu\text{g}/\text{m}^3</math>)</b>		
		<b>Class I</b>	<b>Class II</b>	<b>Class III</b>
PM <sub>10</sub>	Annual	4	17	34
	24-Hour	8	30	60
SO <sub>2</sub>	Annual	2	20	40
	24-Hour	5	91	182
	3-Hour	25	512	700
NO <sub>2</sub>	Annual	2.5	25	50

Source: 40 CFR 52.21.

Class I areas are those of special national concern where any appreciable deterioration in air quality is considered significant. Less restrictive increments apply in areas designated as Class II or Class III.

No PSD Class I areas are located within 50 miles of the proposed training areas. Therefore PSD Class I areas would not be impacted by the proposed training. Franklin County is designated by the EPA as a Class II area.

#### 4.3.1.2 *Ambient Air Quality*

The proposed training area is located within the Tennessee River Valley (Alabama) - Cumberland Mountains (Tennessee) Interstate Air Quality Control Region (AQCR 7). A total of nine major air emission sources are located in these two counties: AEDC, Batesville Casket, M-Tek, B.F. Goodrich Aerospace, Tennessee Dickel Distilling Company, Massillon Cleveland, The University of Tennessee Space Institute, East Tennessee Natural Gas Company, and CKR Industries. Franklin and Coffee Counties are designated as unclassifiable/attainment for all the pollutants for which NAAQS have been established (40 CFR 81.343). It is likely that ambient concentrations of the criteria pollutants are low because the major pollutant sources in these counties are widespread and generally not large-volume.

#### 4.3.1.3 *Emissions*

The amount of pollutants entering the atmosphere (from all sources) in a given time period is used by control agencies to define the emissions in an area. Pollutant emissions resulting from current land uses are estimated to be negligible. At present no training tanks are placed in this area and traffic is limited to periodic Base environmental monitoring and local residents for hunting and recreational use.

### 4.4 *NOISE*

When measuring sound to determine its effects on the human population, A-weighted sound levels, decibels (dBA) are typically used to account for the response of the human ear.

The most obvious possible impacts of noise on humans are hearing loss, speech interference, and sleep cycle interruption. In terms of noise-related effects, levels of 65 dBA and higher are considered significant, and levels below 65 dBA are considered moderate to slight.



The day-night average sound level (DNL) was developed to evaluate the total community noise environment. The DNL is the average A-weighted sound level during a 24-hour period with 10 dB added to nighttime levels (between 10:00 p.m. and 7:00 a.m.). This adjustment is added to account for the increased sensitivity to nighttime noise events. The DNL was endorsed by the EPA and is mandated by the U.S. Department of Housing and Urban Development (HUD), the Federal Aviation Administration (FAA), and the DOD for land use assessments.

#### **4.4.1**      *Existing Noise Levels*

Primary sources of noise on the TTS include the Multiple Launch Rocket System (MLRS), tanks, armored personnel carriers, and other tracked military vehicles; rotary and fixed-wing aircraft; small arms ranges; light-wheeled military vehicles; and construction equipment operated by the TNARNG as well as the Tennessee Air National Guard. These noise sources can be generally classified as intermittent. This class of noise source produces noise levels that rise with time, reach a maximum value, and then fall to the background level. The proposed site does not include any of the above types of noise sources. At present, noise at the proposed training areas is produced from forestry equipment operated by Arnold AFB, generally for the harvesting and planting of trees, and occasional gunfire in the areas utilized for hunting.

Most of the noise on the proposed training areas occurs on weekends. During the remaining periods, noise levels are relatively low. The opening day of dove season is the day with highest noise levels. During that time, numerous hunters utilize the food plot located on the north side of the proposed tank training area to harvest doves. Shooting is continuous during the afternoon of opening day and is greatly reduced after that day. Vegetation around the food plots serves as a noise buffer.

Ambient noise levels were monitored at the Base on 26 October 1999 to quantify existing background noise levels. The ambient noise monitoring included seven locations on the Base, with one near the TTS. The TTS location was just west of Thacker Road and north of Arnold AFB property. The ambient noise measurement at this location consisted of short-term background noise measurement samples (10-minute sample during the daytime). The average noise measured was 55.1 dBA. Noise at this location was attributed to local traffic, farm equipment, and aircraft. Similar noise levels are expected on roads throughout the proposed area (AEDC, CH2M HILL, 2000).

Off-site sensitive noise receptors include the on-base golf course, which is located west of the proposed tank training area. In addition, high-density residential areas of the city of Tullahoma are approximately 3 miles from

the western boundary of the training area. No residential property is located within several miles east, south, or north of the proposed training areas.

## **4.5 GEOLOGY AND SOILS**

### **4.5.1 *Physiography and Topography***

The proposed training areas, the TTS, and Arnold AFB are located in the eastern Highland Rim physiographic province of the Central Highlands of Tennessee where Mississippian-age carbonate rocks are exposed.

The Arnold AFB land surface is level to gently rolling, with dissected, sloping escarpments in the southern portion of the Base facing the Elk River. "The Barrens" is an area that forms much of the central part of the Highland Rim. The Barrens ecosystem includes a number of components including tall grass prairie, oak savanna, oak woodlands, and upland wetlands (AEDC, 1999). On Arnold AFB, the Barrens consists of gently rolling uplands with interspersed depressions and flats that cover much of the land north, south, and west of the AEDC industrial area. The 1,264-acre proposed license area and proposed 154-acre tank laser firing range and artillery maneuver areas are located on the south side of Arnold Center Road, south of the TTS.

Elevations at the Base range from over 1,100 feet in the northern portion to 960 feet along the shoreline of Woods Reservoir. The surface elevations of the proposed ranges are also approximately 1,090 feet to 960 feet.

The eastern part of the Highland Rim is a region of numerous solution caves and sinkholes, forming what is termed "karst topography." Karst features, such as Sinking Pond, are present on Arnold AFB, but karst topography is not well developed on the proposed training area.

### **4.5.2 *Stratigraphy***

Mississippian carbonate rocks crop out over most of the region and are underlain by older shales and carbonates of Devonian and Ordovician age. Impure carbonate rocks are the main lithology, but shales, sandstones, and conglomerates also occur. The carbonate rocks weather to a residual material known as regolith that covers the underlying bedrock. In stream valleys, the bedrock is overlain by alluvial deposits of Quaternary age.

The formations beneath the Base, from oldest to youngest, are undifferentiated formations of late Ordovician age, the Chattanooga

Shale of Devonian age, and the Fort Payne Formation, Warsaw Formation, and St. Louis Limestone, all of Mississippian age. Both the Chattanooga Shale and the Fort Payne Formation crop out just northwest of the proposed site, along the escarpment of the Highland Rim (The Benham Group, 1990). Regolith formed by weathering of the Warsaw and St. Louis Formations occurs over all of the proposed sites, where it ranges in thickness from 30 to 90 feet (Haugh et al., 1992).

The undifferentiated upper Ordovician formations, overlain by the Chattanooga Shale, consist of fossiliferous limestones with sandstone and shale members, as well as chert. The limestone below the Chattanooga Shale is a continuous, thick, dense limestone (CDM Federal Programs Corporation, 1994).

The Chattanooga Shale ranges from 20 to 30 feet thick. It is a dark grayish-black, fissile, carbonaceous shale that forms a consistent, widespread, easily recognizable unit.

The Fort Payne Formation ranges from 20 to 230 feet thick, but is probably 100 feet or less throughout the Proposed Action area. The formation is a dark gray siltstone and cherty limestone with thin beds of crinoidal limestone and minor amounts of shale. There are no outcrops of the Fort Payne Formation on the proposed training areas; instead, the limestone beds lie beneath a deeply weathered zone. The upper portion of the Fort Payne is generally weathered and fractured (CDM Federal Programs Corporation, 1994).

The dominant surface formation on the Base is the Warsaw Formation. The Warsaw is mainly limestone with lenses and beds of sandstone, clay, silt, and chert. It is extremely fossiliferous in some areas. Preservation is best around Woods Reservoir, where the formation contains considerable limestone. Where the limestone has been dissolved, more or less intact layers of sandstone and shale remain. Elsewhere, most of the formation has been reduced by weathering to regolith that contains sandstone, fossil, and chert fragments (The Benham Group, 1990).

#### **4.5.3      *Geologic Structures***

The bedrock at Arnold AFB consists of limestone and dolomite strata that are nearly level or gently dipping toward the east. A broad, gently dipping anticline trends northeast-southwest across the area and small-scale folding is present. There are no known faults that cut across the Base. The Fort Payne bedrock is highly fractured.

The Base lies in Seismic Risk Zone 1, meaning that earthquake damage is unlikely (International Conference of Building Officials, 1994). The

eastern Tennessee seismic zone is a zone of numerous small earthquakes that have occurred in a cluster along the eastern border of the state, but very few epicenters have been located as far west as Arnold AFB.

#### **4.5.4      *Mineral Resources***

In the region, most mineral production has consisted of lime, crushed limestone, chert, and sand and gravel. However, no mineral mining is allowed within Arnold AFB.

#### **4.5.5      *Soils***

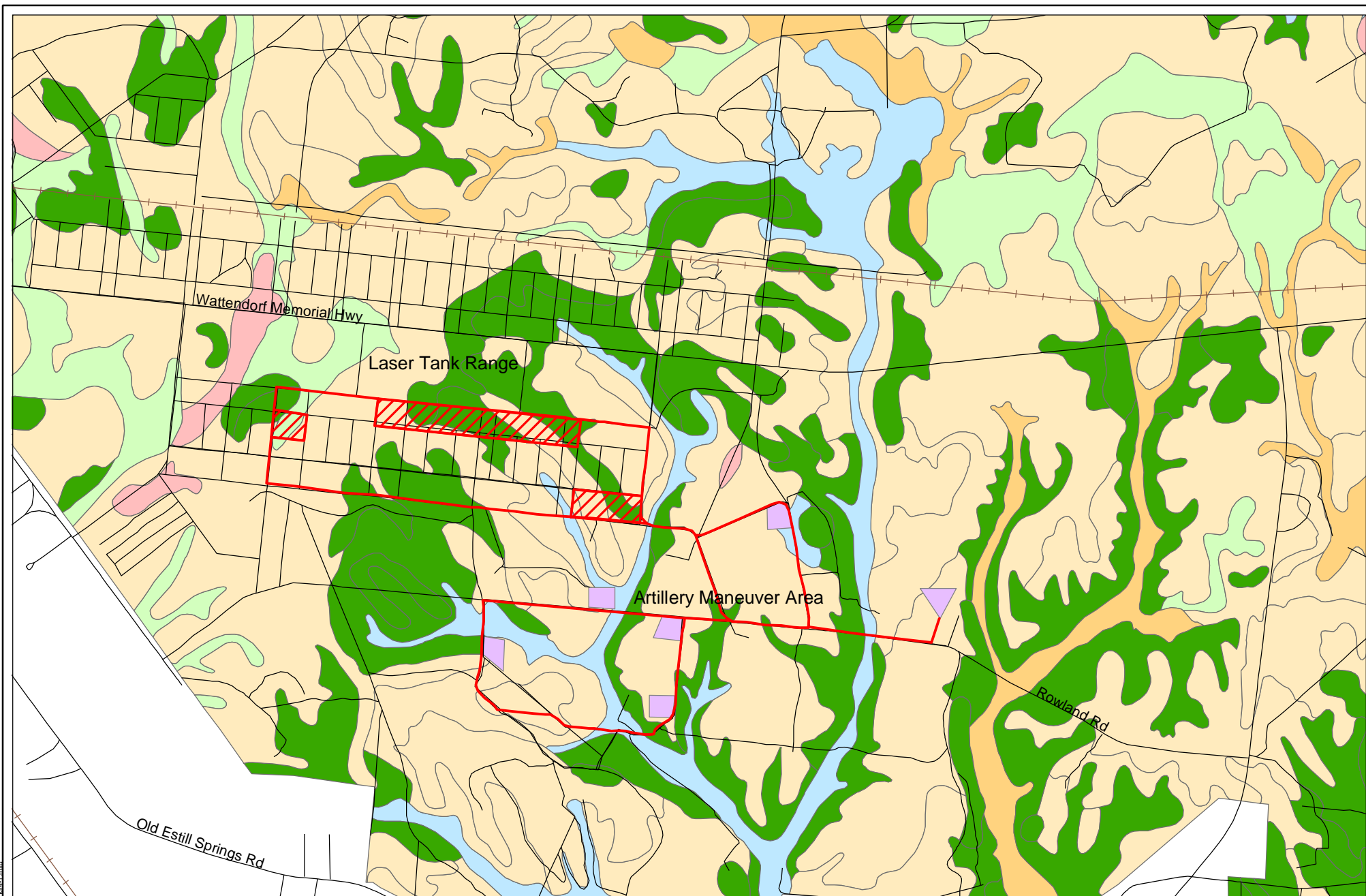
Soils at the proposed training sites have been formed from clay, silt, sand, and chert fragments, which constitute the residual material from weathering of the limestone bedrock. The depth to bedrock is as much as 90 feet. A silt layer up to 3 feet thick is present at the surface over most of the area (Fox et al., 1958; Love et al., 1959).

Construction of Camp Forrest indicates that significant amounts of earth moving activities were conducted in the past (CH2M HILL, 2001). These activities may have significantly altered natural surface soil conditions in places. The soil associations are generalized categories of soil series and types that occur together in a geographical association. They are named for the three dominant soils, but several other similar soils are included (Figure 4-1).

Soils on the Base belong to the Dickson-Mountview-Guthrie Association and consist chiefly of ultisols developed on a thin silty mantle overlying cherty limestone residuum (AEDC, 1999). Dickson and Lawrence soils form the majority of the proposed training area. Dickson and Lawrence soils are silt loams or silty clay loams, generally rock-free, strongly to very strongly acidic, moderately permeable in their surface horizons, and low in fertility. Guthrie and Purdy soils are the hydric soils identified for this area and occupy a relatively small amount of the proposed training area. These soils typically have a fragipan, a dense, compact layer that restricts root growth and decreases permeability.

Lawrence soils consist of somewhat poorly drained soils that have developed in a thin, relatively chert-free, loess-like silt mantle that overlies weathered limestone regolith. Together with Lobelville soils, Lawrence soils generally lie on level upland plains and divides and along incipient drainageways in upland areas.

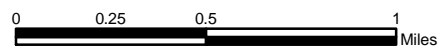
Most of the proposed area is suited for agriculture and forest management, which are current practices on the TTS and in the proposed training area.



# Legend

- |   |  |   |
|---|--|---|
| <span style="display:inline-block; width:10px; height:10px; background-color:lightorange; border:1px solid black;"></span> Dickson  | <span style="display:inline-block; width:10px; height:10px; background-color:lightpink; border:1px solid black;"></span> Purdy   | <span style="display:inline-block; width:10px; height:10px; background-color:lightpurple; border:1px solid black;"></span> Artillery Area |
| <span style="display:inline-block; width:10px; height:10px; background-color:orange; border:1px solid black;"></span> Guthrie       | <span style="display:inline-block; width:10px; height:10px; background-color:yellow; border:1px solid black;"></span> Waynesboro |   |
| <span style="display:inline-block; width:10px; height:10px; background-color:lightgreen; border:1px solid black;"></span> Lawrence  | <span style="display:inline-block; width:10px; height:10px; border:2px solid red;"></span> Laser Tank Range                      |   |
| <span style="display:inline-block; width:10px; height:10px; background-color:lightblue; border:1px solid black;"></span> Lobelville | <span style="display:inline-block; width:10px; height:10px; border-bottom:2px solid black;"></span> Road                         |   |
| <span style="display:inline-block; width:10px; height:10px; background-color:darkgreen; border:1px solid black;"></span> Mountview  | <span style="display:inline-block; width:10px; height:10px; border-bottom:2px dashed brown;"></span> Railroad                    |   |

Figure 4-1  
Soil Series Map  
Proposed Training Areas  
Arnold AFB Tullahoma, TN



**URS**

Most of the soils on the proposed training sites have been classified as well suited for farmland (USDA, 1958, 1959). Over 98 percent of the tank training area is covered by soils that are well suited for farmland. The few areas that are not well suited for farmland have steep slopes, mostly along the larger streams, or lie along nearly level, poorly drained reaches of ephemeral streams.

The depth to the seasonal high water table at Arnold AFB ranges from at or near the surface to depths of 10 feet or more. Dickson, Greendale, Guthrie, Hamblen, Lawrence, Lee, Lobelville, Sango, and Tyler soils have shallow water tables of 2 feet or less. The artillery maneuver areas would be located primarily on Dickson soils, while the staging areas would be located on Dickson, Lawrence, and Mountview soils. Dewatering may be required for gravel-covered areas where these soils are present. The dewatering measures would be addressed in the stormwater plan prepared for each area.

## **4.6 WATER RESOURCES**

### **4.6.1 Surface Water**

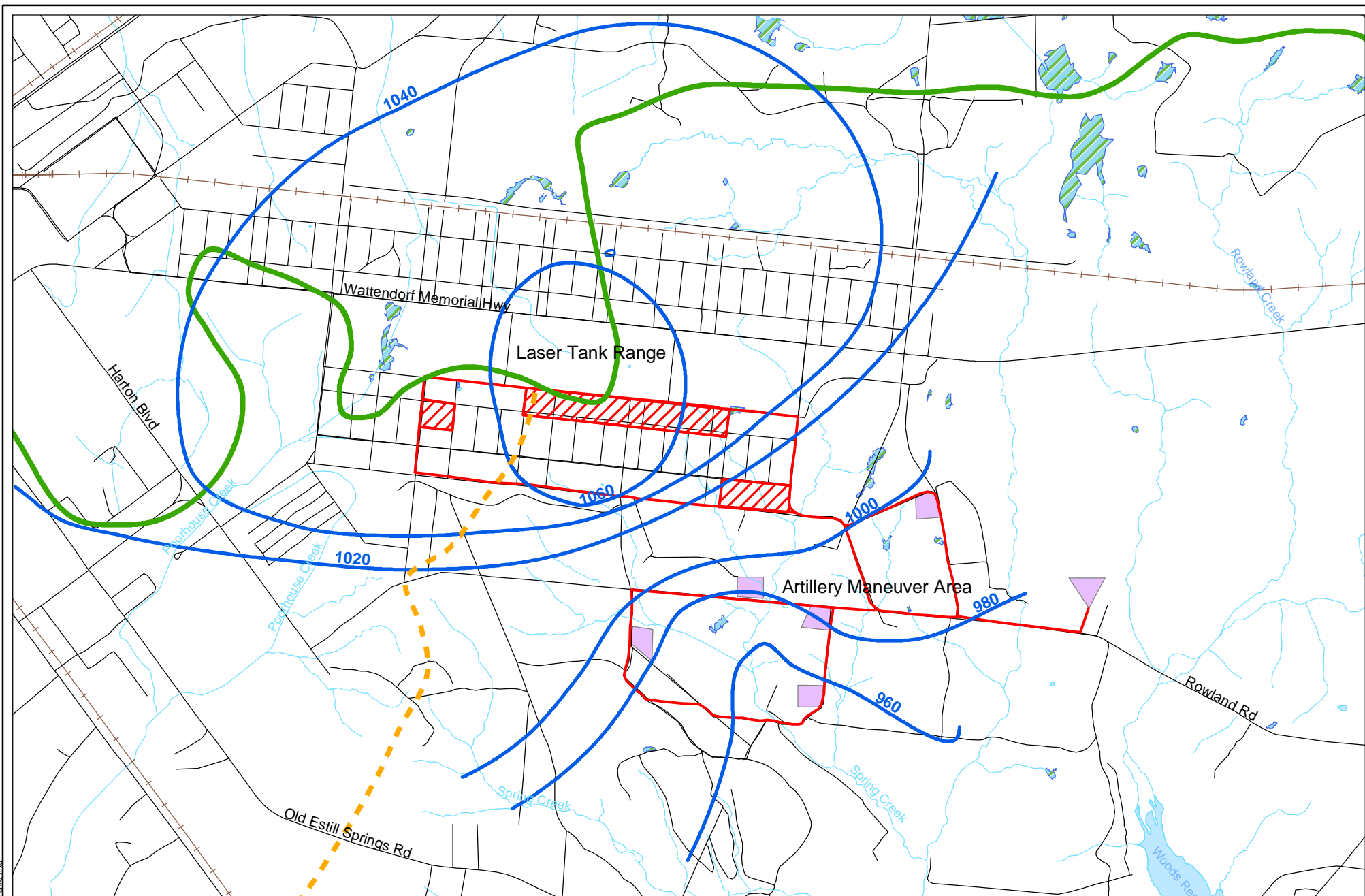
#### **4.6.1.1 Drainage Systems**

Arnold AFB is located in the portion of middle Tennessee that includes the Duck, Elk, and Cumberland River basins. Woods Reservoir, on the southern side of Arnold AFB, and Tims Ford Reservoir, are two major reservoirs on the Elk River.

The proposed training areas drain to the Elk River. The drainage divide between the Duck River and Elk River drainage basins has a sinuous east-west trend through most of Arnold AFB, as shown in Figure 4-2.

Spring Creek and Saltwell Hollow collect the majority of the surface water from the proposed training areas. A small amount of drainage from the proposed tank range flows north to Bobo Creek and a small amount flows west to Poorhouse Creek. Bobo Creek drains north to the Duck River, while Poorhouse Creek drains south to the Elk. Spring Creek drains into the Elk River downstream from the Woods Reservoir Dam.

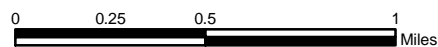
There are no perennial streams on the proposed tank training area and the streams that are located in the route of the artillery maneuver areas are also classified as intermittent. A drainage divide extends through the area, so the headwaters of all of the streams on the site are there and no through-flowing streams are present. Streams on the proposed training



# Legend

- |   |  |
|---|--|
| <span style="color: green;">—</span> Elk/Duck River Divide                    | <span style="color: red;">—</span> Laser Tank Range              |
| <span style="color: orange;">- - -</span> Spring Creek/Poorhouse Creek Divide | <span style="color: black;">—</span> Road                        |
| <span style="color: blue;">—</span> Intermediate Aquifer                      | <span style="color: brown;">- - -</span> Railroad                |
| <span style="color: blue;">—</span> Potentiometric Surface Elevation          | <span style="color: lightblue;">—</span> Stream, Creek, or River |
|   | <span style="color: purple;">■</span> Artillery Area             |

Figure 4-2  
Surface Drainage  
Proposed Training Areas  
Arnold AFB Tullahoma, TN



**URS**

areas are ephemeral, flowing briefly after isolated precipitation events, or for short periods during and after seasonal rainstorms.

Cooling water from the industrial area test facilities empties into the retention reservoir, located at the AEDC, from the J-4 test facility and into the Cooling Water Return Ditch, which crosses the drainage divide into Rowland Creek. Stormwater from the central part of the industrial area is carried by storm sewer and outfall ditches into streams southeast of the TTS. The proposed training areas, therefore, do not receive any surface water discharges from the industrial area.

#### 4.6.1.2 *Floodplains*

The streams on the proposed training areas have only narrow, shallow channels without floodplains. During heavy precipitation, some of the streams may overflow their channels and inundate nearby low, flat areas. Therefore, no portion of the proposed area is within a 100-year flood zone.

#### 4.6.1.3 *Groundwater*

Groundwater occurrence and movement at Arnold AFB are determined by the lithology and structure of the rocks underlying the Base and the characteristics of the unconsolidated regolith lying above the bedrock. Drilling of numerous shallow groundwater monitoring wells in Camp Forrest indicated that the groundwater table occurs at depths ranging from 2 to 26 feet in the portion of the regolith composed of clay, silt, and sand. The shallow groundwater table typically dips in the same direction as the slope of the land surface, although this is not always the case. Reversals in groundwater flow directions occur seasonally. Perched groundwater conditions are evident in some places (CH2M HILL, 2001).

#### 4.6.1.4 *Hydrostratigraphic Units*

Hydrostratigraphic units in the area include four aquifers plus confining units that separate the aquifers. The groundwater system in the area consists of three aquifers that lie above the Chattanooga Shale. The Chattanooga Shale is relatively impermeable and isolates the freshwater aquifers from the Ordovician limestones below. These Ordovician limestones comprise the upper Central Basin aquifer.

#### 4.6.1.5 *Freshwater Aquifers*

Hydrogeologic units that make up the groundwater system above the Chattanooga Shale include the shallow aquifer, the Manchester aquifer, and the Fort Payne aquifer. Franklin and Coffee Counties are underlain



by the Mississippian carbonate rock aquifer system. The Manchester and Fort Payne aquifers make up this system, in which the principal water-bearing geological formations are the St. Louis and Warsaw limestones, and the Fort Payne Formation. The Mississippian and Ordovician carbonate (Central Basin) units are connected to the ground surface in many areas, however, by caves and sinkholes. No caves or sinkholes are known to exist within the proposed training areas.

The shallow aquifer lies nearest the ground surface and forms the unconfined aquifer, which lies above the Manchester aquifer. It has been described as a perched aquifer, though it may not be perched everywhere and therefore may be connected with the underlying Manchester aquifer in some areas.

The shallow aquifer is a water table aquifer that occupies approximately the upper 30 feet of rock and regolith. Groundwater flow in the shallow aquifer has not been well studied but is believed to generally follow topography, except where changes have been caused locally by well pumping or dewatering operations (The Benham Group, 1990). Dewatering from wells at the industrial area is not believed to have altered the groundwater flow directions at the proposed training sites.

The Manchester aquifer lies below the shallow aquifer and is the most productive of the zones (Haugh et al., 1992). Groundwater in this intermediate aquifer in the area of Camp Forrest occurs at depths of between 18 and 77 feet (Haugh, 1992). In general, flow in the Manchester is in the direction of topographically low areas such as stream valleys.

The deep aquifer, typically located below the intermediate aquifer, includes that portion of the bedrock that has few fractures and low yields of water. Flow within the limestone occurs either through vertical fractures and joints or through solution channels along the bedrock bedding planes. Groundwater may flow along horizontal bedding planes and fractures until a larger fracture is intersected. The groundwater then follows the path of least resistance, which could include downward or lateral flow along the fracture. The characteristics of the bedrock fractures are variable across the region. The Chattanooga Shale below the shallow, intermediate, and deep aquifers is considered the confining unit of the Highland Rim aquifer system (CH2M HILL, 2001).

At the proposed license area, there is an extensive distribution of soils typified by the presence of fragipans, associated seasonal wetlands, inclusion of large quantities of unstratified clays and silts, and the many subsurface layers of clays, silts, and sands remaining from the solution of limestones. The combination of particle size, porosity, structure, composition, and other characteristics that exist in the soils at the

proposed training areas suggests that water movement through the material of the shallow aquifer is slow.

#### 4.6.1.6 *Water Supply*

Water supply wells near the Proposed Action are located on the TTS at the tennis courts, golf course, small arms range, and airfield. Water is pumped from these wells, chlorinated, and distributed for local use. Wells located at the golf course and rifle range have cartridge filters in series to comply with “ground water under the direct influence of surface water” drinking water regulation. Water for the cantonment area on the western end of the TTS is supplied from the Tullahoma municipal system. All of these wells are located north of the proposed training areas.

Presently, there is no known water use in the proposed training area.

Yields from the freshwater aquifer system vary. In some areas of the southeastern Highland Rim, there are gravel zones in the regolith that yield as much as 400 gallons per minute to wells. The potential yields from zones underlying the proposed training area are unknown, but yields from wells on and adjacent to this area are adequate to meet the present demand.

#### 4.6.2 *Water Quality*

Most of the information on water quality is from the industrial area of Arnold AFB, where there has been extensive sampling and testing of both groundwater and surface discharges. In contrast, little is known about water on the proposed training areas except that open water bodies are very few and the streams are intermittent. In 1990, the U.S. Geological Survey (USGS), in cooperation with the USAF and Arnold AFB, began a comprehensive investigation of the hydrogeology of the Base area. The USGS has installed 65 monitoring wells on Arnold AFB, 14 of which are located on the TTS. As a result, water quality information is now available for the areas outside of the industrial area. Thus far, no information concerning water quality of surface streams on the TTS or the proposed training areas is available. However, as a part of the Camp Forrest Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI), surface water sampling would take place at a number of locations south of the proposed tank training area in Spring Creek and Saltwell Hollow. As previously noted, these streams are ephemeral, and surface water flow occurs only in response to rainfall runoff or high perched water flow.

Of the 14 wells completed on the TTS by the USGS, 1 was completed in the shallow aquifer, 10 were completed in the Manchester aquifer, 2 were completed in the Fort Payne aquifer, and 1 was completed in the upper Central Basin aquifer. Water samples were analyzed for major inorganic constituents, trace metals, volatile organic compounds (VOCs), and physical properties (Table 4-3).

In wells drilled on the Base, water from the Central Basin aquifer had a median total dissolved solids content of 1,712 milligrams per liter (mg/L) (Haugh et al., 1992). Because this exceeds the state of Tennessee Drinking Water Standard of 500 mg/L, the Central Basin aquifer is not used as a ground water source in the area; adequate supplies of better quality water are obtained from shallower depths. The proposed license area currently includes no water wells (TDEC, 1995).

The results of the water quality analyses indicate that different geochemical processes affect water from each aquifer. Total dissolved solids in the TTS area ranged from 12 mg/L in wells AEDC-183 and AEDC-231 to 1,290 mg/L in well AEDC-193. The average dissolved solids concentrations for the TTS area were 105 mg/L in the shallow aquifer, 42 mg/L in the Manchester aquifer, 1,210 mg/L in the Fort Payne aquifer, and 742 mg/L in the upper Central Basin aquifer. Most of the inorganic constituents (calcium, magnesium, sodium, potassium, chloride, sulfate, fluoride, and silica) followed a similar trend, with the lowest concentrations in the shallow and Manchester aquifers and the highest concentrations in the upper Central Basin aquifer.

Although some compounds were detected, analyses showed that concentrations of most volatile organic compounds (VOCs) were below the detection limits. However, most wells sampled in the TTS area showed the presence of the aromatic hydrocarbons - benzene, toluene, ethyl benzene, and xylene (BTEX). The highest concentrations were found in well AEDC-181, which is completed in the upper Central Basin aquifer. These compounds occur naturally in association with petroleum deposits (Haugh et al., 1992; Slaine and Barker, 1990). Although it has not been proven, the presence of BTEX in the Central Basin aquifer is likely to be from these sources, because petroleum may originate from the Ordovician rocks of this region.

#### 4.6.2.1 *Wastewater Discharge*

No wastewater discharges are located in the proposed training areas.

**Table 4-3 Ground Water Quality Monitoring at Proposed Training Sites**  
**Arnold Air Force Base, Tullahoma, Tennessee**

Analytical Parameter	Well Number							
	AEDC 172	AEDC 173	AEDC 174	AEDC 190	AEDC 191	AEDC 220	AEDC 221	AEDC 236
pH (S.U.)	7.10	7.90	7.40	7.20	6.90	5.60	4.90	5.7
Specific Conductance, (uS/cm)	3390	212	179	1230	94	11	148	72
Alkalinity (mg/l)	170	96	90	622	39	19	4	28
ORP (mV)	NA	365	420	620	160	330	560	530.00
Hardness (mg/l)	710	110	92	300	41	18	3	33.00
Calcium (mg/l)	250	36	29	65	9.8	5.5	0.65	11.00
Magnesium (mg/l)	20	5	4.8	34	4.1	1.1	0.22	1.30
Potassium (mg/l)	30	0.2	0.2	2.8	0.7	1.4	0.1	0.40
Sodium (mg/l)	510	1	0.8	140	1	2	0.6	1.5
Chloride (mg/l)	360	0.4	0.5	27	1.5	1.4	0.7	0.8
Sulfate (mg/l)	1300	7.9	1.8	4.8	1.2	1.7	0.3	1.1
Flouride (mg/l)	0.5	<.1	<.1	0.6	<.1	<.1	<.1	<.1
Silica (mg/l)	9	8.1	7.8	11	7.5	7.9	7.8	8.2
Dissolved Solids (mg/l)	2450	114	90	659	48	43	27	46
Solids (mg/l)	2580	119	101	630	52	34	13	44
Barium (ug/l)	59	<2	2	39	3	9	3	5
Iron (ug/l)	1200	<3	48	11	9	8	5	30
Lithium (ug/l)	960	<4	<4	450	<4	4	<4	<4
Manganese (ug/l)	300	<1	1	10	23	14	12	160
Strontium (ug/l)	1900	28	19	<6	<6	<6	<6	<6
Benzene (ug/l)	1600	<.2	<.2	1.8	12	0.3	<.2	0.2
Toluene (ug/l)	350	<.2	<.2	2	7.6	0.6	<.2	<.2
Ethyl Benzene (ug/l)	2.4	<.2	<.2	0.3	0.6	<.2	<.2	<.2
Xylene (ug/l)	46	<.2	<.2	1	1.7	0.3	<.2	<.2

mg/l: milligrams per liter

g/l: micrograms per liter

Source: Haugh et. al. 1992

NA: Not Analyzed

## 4.7 *BIOLOGICAL RESOURCES*

The TTS and proposed license area are part of an ecosystem that is known as the Barrens region of the eastern Highland Rim. It formerly encompassed a wide range of habitats, including oak woodland, oak savanna, shrub-grassland, prairie (grassland), and wetlands (TNARNG, 2001). The present area includes pine forest as well. On Arnold AFB, the present vegetation is upland and swamp oak forest. At least 77 rare plant and animal species are known to exist on the Base: 3 Federally listed and 74 state listed. In addition to these species, numerous natural communities, plants, and animals contribute to the high biodiversity at the Base (USAF, 1996).

### 4.7.1 *Terrestrial Resources*

Terrestrial resources include native and introduced plants and animals. For discussion purposes, these are divided into vegetation, wildlife, sensitive habitats, and threatened, endangered, and management concern (MC) species.

#### 4.7.1.1 *Vegetation*

Historically, the vegetation of the proposed license area consisted of an oak-hickory forest on the better-drained soils and a mixed bottomland hardwood on the poorly drained planosol soils. Interspersed within the forested areas on the slightly drier soils were a few open grassland/forb communities. Most were maintained, even in pre-settlement times, by natural or man-induced disturbances of fire, grazing, and farming. High-grade logging practices and burning of woodland for pasture throughout this area for over 100 years have also created a forest which consists primarily of blackjack oak (*Quercus marilandica*), post oak (*Q. stellata*), red oak (southern-*Q. falcata*, northern-*Q. rubra*), scarlet oak (*Q. coccinea*), and a few other hardwood species on the poorer upland soils. The stands of bottomland hardwood that produce high quality timber occur on the planosol soils (USAF, 1996). The present vegetation at the site consists predominantly of stands of hardwoods or pines interspersed by cleared areas, which are either being allowed to develop with early successional species, are planted with pines, or are maintained as wildlife food plot areas. Hardwood timber on the site is primarily the oak-hickory association, although pines are planted and harvested in the former Camp Forrest area.

The Arnold AFB area, including the proposed training area, was extensively cut and burned for cattle ranges between 1890 and 1910. However, in the swampy or wet areas, the trees did not burn, and the timber developed into good stands that are now 75 to 85 years old.

Common species of hardwood in the area include beech (*Fagus grandifolia*), black gum (*Nyssa sylvatica*), hickory (*Carya sp.*), willow oak (*Quercus phellos*), overcup oak (*Q. lyrata*), post oak, red oak, scarlet oak, white oak (*Q. alba*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), American elm (*Ulmus americana*), boxelder (*Acer negundo*) and yellow poplar (*Liriodendron tulipifera*) (AEDC, 1999).

Pine trees are abundant, although pine is not native to this part of middle Tennessee. Pines were originally planted at the TTS and the entire Arnold AFB area as part of a sound attenuation program between 1950 and 1960. Loblolly (*Pinus taeda*), short leaf (*P. echinata*), Virginia (*P. virginiana*), and white pine (*P. strobus*) were planted in fields and other areas that required little or no site preparation. Because loblolly pine grew so successfully, more were planted between 1960 and 1972. In response to harvesting, poor tree quality, and the death of trees, a pine reforestation plan was initiated in 1983, and by 1988, 1,028 acres had been reforested. The pine reforestation has concentrated on the poorer stocked, less productive plantations first, to improve the overall quality of the pine forest. A program goal is to reforest approximately 200 acres per year (AEDC, 1999).

Analysis of land use maps provided by the AEDC indicates approximately 65 percent of the proposed tank training area is forested, primarily in pine. Approximately 10 percent is hardwood, 20 percent is non-forested, and 14 percent is clear cut from recent logging operations (Figure 4-3). The artillery training area is located among a variety of vegetative habitats. Each proposed artillery maneuver area is located in an open to partially open area. The partially open areas include new growth hardwood and pine forest and include invasive plant species such as kudzu, autumn olive, *Serecia lezbedesa*, and multi-flora rose.

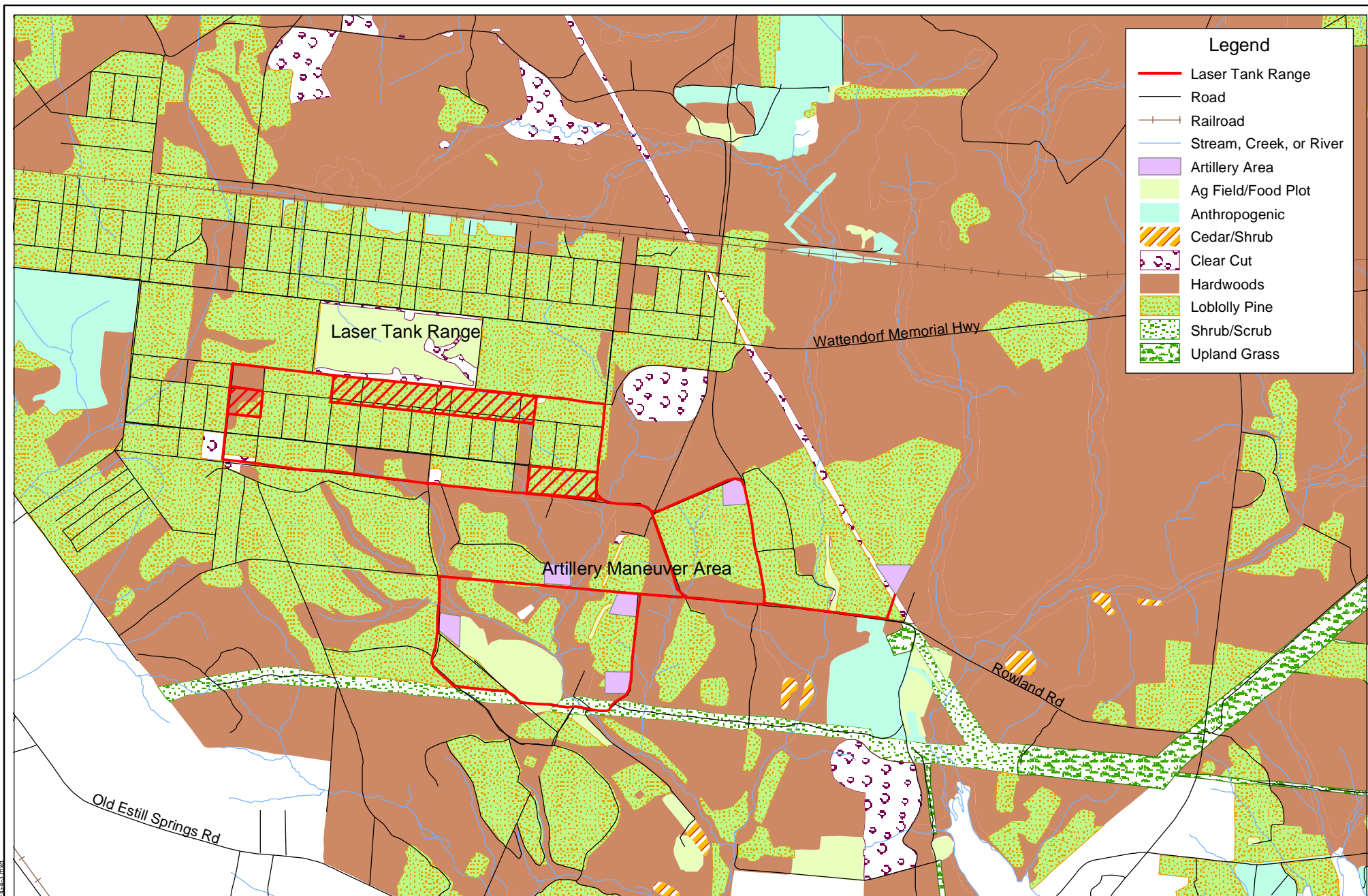
#### 4.7.1.2 *Invasive Pest Plant*

The Invasive Pest Plant (IPP) management Plan identified 14 priority IPP species based on their potential threat to ecological and agricultural systems on Arnold AFB. Most of the priority IPPs at the Base are included in the Tennessee Exotic Pest Plant Council's (TN-EPPC) list of 'Severe' and 'Significant' threat category IPPs (TN-EPPC, 2002). The list of invasive plant species documented on Arnold AFB is presented in Table 4-4.

The main pathways of dispersal for these species range from bird/small mammal dispersal to water dispersal. They may also be transported by vehicles when off-road travel occurs.

**Table 4-4 Invasive Pest Plant Species Present on AAFB**  
**(\*Denotes 14 priority IPPs)**

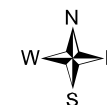
<b>Scientific Name</b>	<b>Common Name</b>	<b>TN-EPPC Rank</b>
<i>Ailanthus altissima</i>	Tree of heaven	Severe
<i>Albizia julibrissin</i>	Mimosa	Severe
<i>Alliaria petiolata</i> *	garlic mustard	Severe
<i>Celastrus orbiculatus</i> *	Oriental bittersweet	Severe
<i>Elaeagnus umbellata</i> *	autumn olive	Severe
<i>Lespedeza cuneata</i> *	sericea lespedeza	Severe
<i>Ligustrum sinense</i> *	Chinese privet	Severe
<i>Ligustrum vulgare</i> *	Common privet	Severe
<i>Lonicera japonica</i> *	Japanese honeysuckle	Severe
<i>Microstegium vimineum</i> *	Japan grass	Severe
<i>Paulownia tomentosa</i>	Princess tree	Severe
<i>Pueraria montana</i> *	kudzu	Severe
<i>Rosa multiflora</i> *	multiflora rose	Severe
<i>Sorghum halepense</i> *	Johnsongrass	Severe
<i>Arthraxon hispidus</i> *	hairy jointgrass	Significant
<i>Bromus japonicus</i>	Japanese brome	Significant
<i>Bromus secalinus</i>	Rye brome	Significant
<i>Carduus nutans</i>	Musk thistle	Significant
<i>Clematis ternifolia</i>	Leatherleaf clematis	Significant
<i>Coronilla varia</i>	Crown vetch	Significant
<i>Daucus carota</i>	Queen Anne's-lace	Significant
<i>Festuca arundinacea</i> *	fescue	Significant
<i>Lespedeza bicolor</i> *	bicolor lespedeza	Significant
<i>Lysimachia nummularia</i>	Moneywort	Significant
<i>Melilotus alba</i>	white sweet clover	Significant
<i>Melilotus officinalis</i>	yellow sweet clover	Significant
<i>Rorippa nasturtium-aquaticum</i>	watercress	Significant
<i>Verbascum thapsus</i>	common mullein	Significant
<i>Vinca minor</i>	Periwinkle	Significant
<i>Wisteria sinensis</i>	wisteria	Significant
<i>Xanthium strumarium</i>	common cocklebur	Significant
<i>Allium vineale</i>	field garlic	Lesser threat
<i>Cichorium intybus</i>	chicory	Lesser threat
<i>Kummerowia striata</i>	Japanese clover	Lesser threat
<i>Ornithogalum umbellatum</i>	Star of Bethlehem	Lesser threat
<i>Senna obtusifolia</i>	Sicklepod senna	Lesser threat
<i>Agrostis stolonifera</i>	Weeping love grass	Watch list A
<i>Hypericum perforatum</i>	Goatweed	Watch list A
<i>Muscari spp</i>	Grape hyacinth	Watch List A
<i>Pyrus calleryana</i>	Bradford pear	Watch list A
<i>Pinus strobus</i>	Easern white pine	Not on list
<i>Pinus taeda</i> *	loblolly pine	Not on list
<i>Pinus virginiana</i>	Virginia pine	Not on list
<i>Poncirus trifoliata</i>	Trifoliate orange	Not on list



URS

0 0.25 0.5 1 Miles

Figure 4-3  
Vegetation Map  
Proposed Training Areas  
Arnold AFB Tullahoma, TN





The area known as Saltwell Hollow encompasses 147 acres and is characterized as a dry-upland to mesic, oak-hickory forest and a young clear-cut that once contained habitat similar to the existing forests in the unit. Prior to the Barrens Restoration Demonstration project, the forested portions of the site supported many oaks (scarlet, southern red, white, and blackjack), the spreading crown structures of which suggest early growth in relatively open habitat. Natural succession in the clear-cut had led to the establishment of native warm season grasses and associated forbs. With time, however, the course of succession began to give way to woody species and oak resprouts. This restoration unit is divided into two portions by a natural gas pipeline right-of-way (ROW). In the spring of 1996, an arson fire burned most of the unit lying east of the pipeline and burned all of the clear-cut west of the pipeline. The section east of the pipeline ROW was not included in the ecological burn conducted in the spring of 1997 but was included in all subsequent prescribed burns. The site is underlain primarily by Dickson silt loam, which occurs on the dry uplands dominating the site. The drainage through the site is underlain by Greendale cherty silt loam, which grades into Baxter silt loam in transitional uplands before changing to Dickson silt loam. Greendale cherty silt loam is a well drained to moderately well drained cherty soil of the colluvial lands that is derived from the local alluvium or colluvium that washed from uplands underlain by cherty limestone. The soil is medium to strongly acidic and low in organic matter, though higher in content than adjacent upland soils. Moisture-holding capacity is fair to good, and the soil is fairly permeable to air, roots, and water. A single wetland on the site is dissected by the natural gas pipeline ROW and occurs on Guthrie silt loam.

Arnold AFB maintains a graphic GIS coverage of Eggert's sunflower distribution. The species was listed as "threatened" by the US Fish and Wildlife Service (USFWS) in 1997 and is listed as threatened by the Tennessee Division of Natural Heritage (TDNH). The species' global biodiversity rank is G3 (i.e., very rare and local throughout its range with 21-100 occurrences with less than 10,000 individuals) and the state rank is S3 (i.e., rare and uncommon in the state with 21-100 occurrences) (TDEC-DNH, 2001). A baseline inventory was conducted in 1997, and more sites are identified and added annually. The latest population status (2002 data) identifies 123 element occurrences (EOs), which are composed of 205 sub-element occurrences, with many individual occurrences or clusters of the plant. Eleven occurrences of Eggert's sunflower were identified in the proposed license area. However, these are individual cluster occurrences and do not comprise one of the 205 sub-element occurrences; the proposed license area is not considered critical habitat.

Three faunal species that were documented by Bailey et al (2003) from the Saltwell Hollow site receive special status from the TWRA. Eastern woodrat (*Neotoma floridana*) and Eastern slender glass lizard (*Ophisaurus attenuatus, longicaudus*) are listed as “wildlife in need of management,” and the northern pine snake (*Pituophis melanoleucus*) is listed as “threatened.” Three pine snakes used Saltwell Hollow as part of their home ranges (Bailey et al., 2002; Bailey et al., 2003). These same three snakes hibernated within the site – one individual in 2001, two in 2002, and one in 2003.

#### 4.7.2

#### Wildlife

Wildlife on Arnold AFB and the proposed training areas includes both game and non-game species. Common mammals include bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), mink (*Mustela vison*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), whitetail deer (*Odocoileus virginianus*), eastern fox squirrel (*Sciurus niger*), and eastern cottontail rabbit (*Sylvilagus floridanus*). Raptors on the site include Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), barn owl (*Tyto alba*), and great horned owl (*Bubo virginianus*). Other avian species include wild turkey (*Meleagris gallopavo*), northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), Canada goose (*Branta canadensis*), great blue heron (*Ardea herodias*), killdeer (*Charadrius vociferus*), rock dove (*Columba livia*), blue jay (*Cyanocitta cristata*), northern mockingbird (*Mimus polyglottos*), robin (*Turdus migratorius*), blue-gray gnatcatcher (*Polioptila caerulea*), starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), Eastern meadowlark (*Sturnella magna*), red-winged blackbird (*Agelaius phoeniceus*), northern cardinal (*Cardinalis cardinalis*), American goldfinch (*Carduelis tristis*), grasshopper sparrow (*Ammodramus savannarum*), and song sparrow (*Melospiza melodia*) among others.

A number of mammals are hunted as large and small game on the site, including whitetail deer, eastern fox squirrel, raccoon, opossum, and eastern cottontail rabbit. The major game land birds are wild turkey, northern bobwhite, and mourning dove. Waterfowl are hunted off-site of the proposed license area on Woods Reservoir, including Canada goose, snow goose (*Chen hyperborea*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), green-winged teal (*Anas crecca*), northern shoveler (*Anas clypeata*), wood duck (*Aix sponsa*), redhead (*Aythya americana*), canvasback (*Aythya valisineria*), bufflehead (*Bucephala albeola*), ruddy duck (*Oxyura jamaicensis*), hooded merganser (*Lophodytes cucullatus*), common merganser (*Mergus merganser*), and American coot (*Fulica americana*) (USAF, 1996).

Common reptile and amphibian species in the vicinity include mud turtle (*Kinosternon subrubrum*), slider (*Trachemys scripta*), eastern box turtle (*Terrapene carolina*), broad-headed skink (*Eumeces laticeps*), corn snake (*Elaphe guttata*), northern water snake (*Natrix sipedon*), common garter snake (*Thamnophis sirtalis*), black racer (*Coluber constrictor*), rat snake (*Elaphe obsoleta*), tiger salamander (*Ambystoma tigrinum*), spotted salamander (*A. maculatum*), mole salamander (*A. talpoideum*), northern fence lizard (*Sceloporus undulatus hyacinthinus*), green frog (*Rana clamitans*), bullfrog (*R. catesbiana*), southern leopard frog (*R. utricularia*), American toad (*Bufo americanus*), and gray treefrog (*Hyla versicolor*). The copperhead (*Agkistrodon contortrix*) is the only poisonous snake listed at Arnold AFB by the TWRA (USAF, 1996).

#### 4.7.3 *Aquatic Resources*

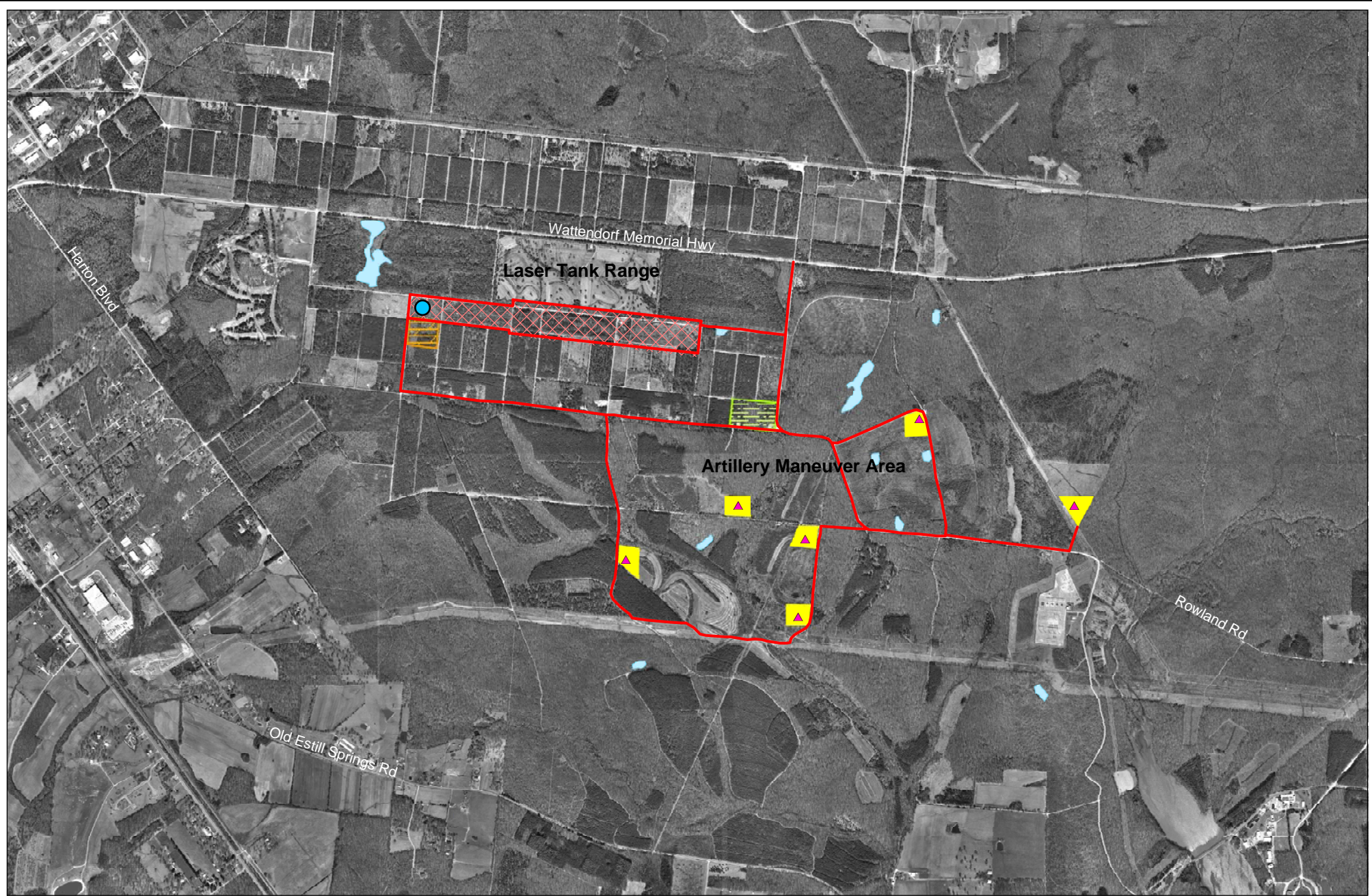
Most of the aquatic habitats on the proposed training areas do not maintain surface water for the entire year. While the intermittent streams are dry a portion of the year, fish may be present in the streams during the wet season. The fish species likely to occur include small stream species such as bluntnose minnow (*Pimphales notatus*), yellow bullhead (*Ameiurus natalis*), logperch (*Percina caprodes*), longear sunfish (*Lepomis megalotis*), bluegill (*L. macrochirus*), and stone rollers (*Campostoma anomalum*) (UASF, 1996).

#### 4.7.4 *Wetlands*

To meet the definition of "jurisdictional wetland" under Section 404 of the Clean Water Act, an area must exhibit three traits: 1) hydrophytic vegetation, 2) hydric soil, and 3) wetland hydrology.

The USFWS surveyed 300 potential wetland sites on Arnold AFB in 1998 to verify wetlands mapped in 1993 and found that 220 of those met the Corps of Engineers criteria for wetland designation. The 220 wetlands comprised 1,894 acres varying in size from 0.05 to 270 acres, most wetlands on the Base are less than 1 acre in size (AEDC, 1999). Several rare community types at Arnold AFB are associated with wetlands. Two wetlands on the Base, Sinking Pond and Goose Pond, are registered National Natural Landmarks. Neither of these wetlands is in or near the Proposed Action. A total of 7 wetlands comprising approximately 2 acres occur within the approximately 1,264-acre proposed license area (Figure 4-4). Most of the wetland acreage is located in one wetland approximately 1,000 feet east of the proposed tank range. This wetland is not adjacent to the proposed target area. A second smaller wetland of approximately 0.1 acre is located west of the turnaround area for the tank target range. The tank target range was designed to avoid a turnaround zone adjacent to this wetland area.

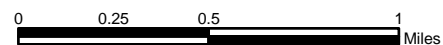




**Legend**

- ▲ Artillery Site
- Tank Tower
- Tank Track
- ▨ Tank Course
- ▨ Tank Staging
- ▨ Artillery Staging
- Artillery Area
- Wetlands

Figure 4-4  
Wetland Locations  
Proposed Training Areas  
Arnold AFB Tullahoma, TN



**URS**

Two wetlands are located adjacent to the route of the artillery training but are not directly adjacent to the artillery training roads. The route of the artillery training crosses some drainages on currently used roads, though these drainages are non-perennial flow streams and not previously identified as wetland habitat.

Within the forested wetlands, the canopy was most often dominated by willow oak or red maple with some black gum, sweet gum, and white oak. In wetlands that appeared not to experience prolonged ponding during the growing season, but have a high water table and saturated soils, the shrub/sapling layer was typically dominated by black highbush blueberry (*Vaccinium atrococcum*), woolly azalea (*Rhododendron canescens*), red maple, black gum, and/or sweet gum. In the herbaceous layer, common species include common greenbrier (*Smilax rotundifolia*), slender spikegrass (*Chasrnanthium laxum*), royal fern (*Osmunda regales*), cinnamon fern (*O. cinnamomea*), partridgeberry (*Mitchella repens*), and several species of sedges (*Carex* spp.).

#### 4.7.5 *Threatened, Endangered, and Management Concern Species*

The federal and state status of sensitive wildlife and plant species known to occur on the proposed training area are included in Table 4-5, and their locations are shown in Figure 4-5. One federally listed (endangered) species of bat, the gray bat (*Myotis grisescens*) is known to feed at Woods Reservoir. Arnold AFB, including the proposed training area, provides a potential habitat area for this species. A gray bat colony exists within the Woods Reservoir Dam; however, no other colonies are known to exist on the Base at this time. There are three federal MC species on the proposed training area: Bachman's sparrow (*Aimophila aestivalis*); northern pine snake; and flame chub (*Hemitremia flammea*).

One federally listed plant species has been found in abundance on Arnold AFB (Figure 4-6). Eggert's sunflower is mapped to occur north of the proposed tank target area in MU 7452 and in greater abundance north of Wattendorf Memorial Highway (Figure 4-7). In response to concerns that the placement of targets in MU 7452 may affect Eggert's sunflower, Arnold AFB and the TNARNG revised the tank training course and provided a revised training design (and second Draft of the EA) to USFWS and other agencies on 21 February 2003.

The Proposed Action, with revised tank training design and schedule, is not expected to have a significant negative effect on Eggert's sunflower, and with the clearing of 90 acres of forest cover controlled to maintain a 3-foot canopy in the tank target area, Eggert's habitat may be enhanced in this area. USFWS reviewed the 21 February 2003 draft and has recommended that the potentially disturbed areas be surveyed for the

**Table 4-5 Rare, Threatened and Endangered Species**  
**Tennessee Army National Guard, South of Arnold Center Rd., Tullahoma Quadrangle**

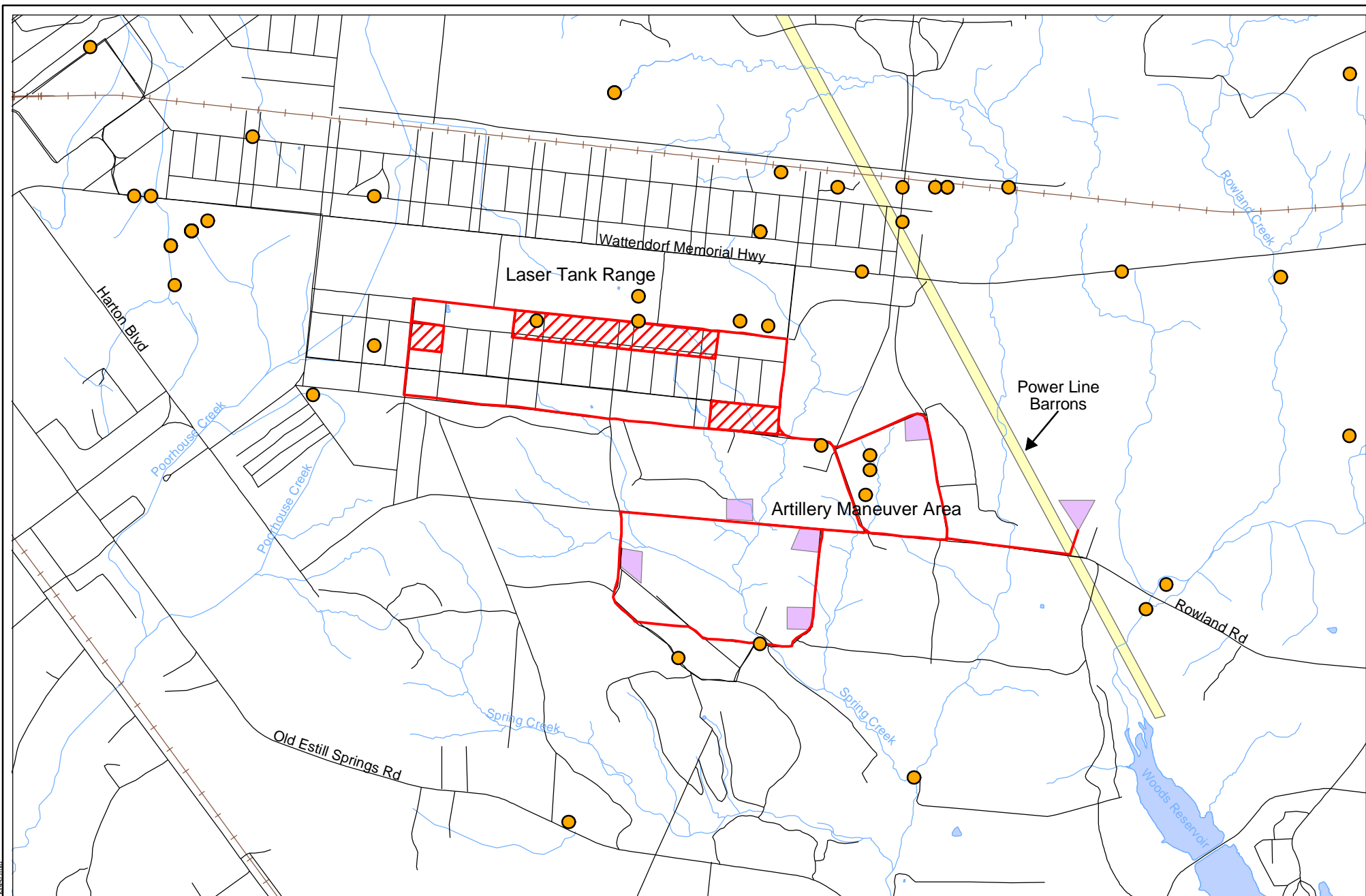
Sighting No.	Species		Comments	Status	
	Scientific Name	Common Name		Federal	State
58	<i>Agalinis pseudaphylla</i>	Shinner's falseglove	Barrens		E
53	<i>Helianthus eggertii</i>	Eggert's sunflower	South of Road 8 (Barrens)	T	T
54	<i>Drosera brevifolia</i>	Dwarf sundew	In logging clearcut (wet barrens)		T
55	<i>Prunus pumila</i>	Sand cherry	Compartment 768 (barrens)		T
18	<i>Asclepias hirtella</i>	Prairie Milkweed	Golf course		S
19	<i>Asclepias hirtella</i>	Prairie Milkweed	Golf course		S
	<i>Prunus pumila</i>	Sand cherry	Golf course		T
20	<i>Helianthemum propinquum</i>	Low frostweed	Golf course		S
	<i>Drosera brevifolia</i>	Dwarf sundew	Golf course		T
	<i>Gaylussacia dumosa</i>	Dwarf Huckleberry	Golf course		T
	<i>Lespedeza angustifolia</i>	Narrowleaf bushclover	Golf course		T
	<i>Rhynchospora perplexa</i>	Obscure beak-rush	Golf course		T
	<i>Panicum acuminatum var. leucothrix</i>	Eaton's witchgrass	Golf course		S
	<i>Gymnopogon brevifolius</i>	Broad-leaved beardgrass	Golf course		S
64	<i>Prenanthes aspera</i>	Rough rattlesnake-root			E
40	<i>Ambystoma talpoideum</i>	Mole salamander			
42	<i>Accipiter striatus</i>	Sharp-shinned hawk		(PS)	D
44	<i>Sorex longirostris</i>	Southeastern shrew	field		D
46	<i>Aimophila aestivalis</i>	Bachman's sparrow		MC	E
50	<i>Sorex longirostris</i>	Southeastern shrew			D
59	<i>Ophisaurus attenuatus longicaudus</i>	Eastern slender glass lizard			D
41	<i>Hemitremia flammea</i>	Flame chub	Pipeline and stream intersect	MC	D
48	<i>Hemitremia flammea</i>	Flame chub	Spring Creek crossing	MC	D

**Table 4-5 Rare, Threatened and Endangered Species**  
**Tennessee Army National Guard, South of Arnold Center Rd., Tullahoma Quadrangle**

Sighting No.	Species		Comments	Status	
	Scientific Name	Common Name		Federal	State
31	<i>Sorex longirostris</i>	Southeastern shrew			D
14	<i>Hemitremia flammea</i>	Flame chub	Gravel road creek crossing near power line & pipeline crossing	MC	D
	<i>Pituophis melanoleucus melanoleucus</i>	Northern Pine Snake	Pine forrest	MC	T
67	Barren areas		Saltwell Hollow Barrens		
66	Barren areas		Powerline Barrens		
31	Barren areas		Model Airfield Barrens		
68	Barren areas		Spring Creek Rd Barrens		

E: Endangered  
T: Threatened  
PS: Partial Status  
MC: Management Concern  
S: Special Concern





#### Legend

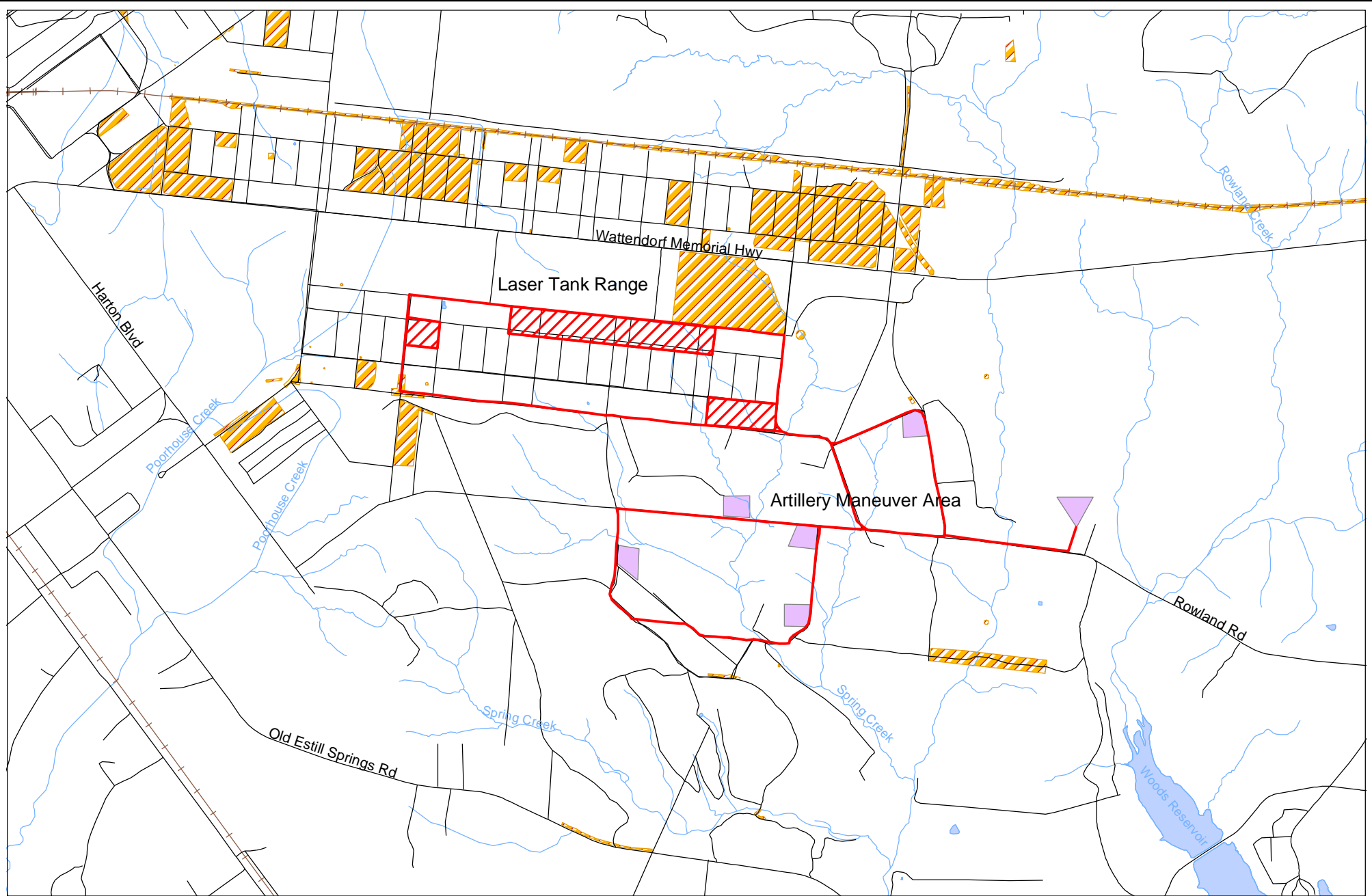
- Laser Tank Range
  - Road
  - Railroad
  - Stream, Creek, or River
  - Rare, Threatened, and Endangered Species
  - Artillery Area
  - Lake or Reservoir
- 0 0.25 0.5 1 Miles

**Figure 4-5**  
**Rare, Threatened, or Endangered**  
**Species and Sensitive Habitat**  
**Proposed Training Areas**  
**Arnold AFB Tullahoma, TN**



**URS**

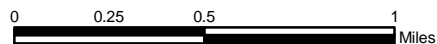




**Legend**

- |  |  |
|--|--|
|  Laser Tank Range        |  Eggert's Sunflower |
|  Road                    |  Artillery Area     |
|  Railroad                |  Lake or Reservoir  |
|  Stream, Creek, or River |  |

**Figure 4-6**  
**Eggert's Sunflower**  
**Proposed Training Areas**  
**Arnold AFB Tullahoma, TN**



**URS**







presence of Eggert's sunflower in correspondence dated 16 July 2003. The TNARNG would conduct an Eggert's sunflower survey of all sites that would be disturbed prior to construction. These surveys would be conducted prior to construction (approximately 2 years) in order to provide the most current information on the distribution of Eggert's sunflower.

## **4.8 CULTURAL RESOURCES**

### **4.8.1 Prehistoric Resources**

Prehistoric chronology of the southeastern United States has been divided into four major periods: Paleo-indian, Archaic, Woodland, and Mississippian. The main criteria for the division of these periods are typological differences in projectile point forms and the introduction of agriculture. Dates assigned to the prehistoric periods differ among different regions in the Southeast.

As of January 2004, there were 107 archaeological sites on Arnold AFB. The State Historic Preservation Officer (SHPO) has provided formal comment on 69 of these sites (McWhite, 2004). The types of sites recorded on Arnold AFB include isolated finds of prehistoric Native American lithics, extensive scatters of lithic debris containing artifacts dating from the Paleo-Indian through the Late Woodland periods, scatters of early to mid-19<sup>th</sup> century ceramics and glass, the remains of late 19<sup>th</sup>/early 20<sup>th</sup> century farmsteads, and elements of the Camp Forrest built environment. All Native American elements of this archaeological record date prior to the 16<sup>th</sup> century.

Recommendations regarding the significance and future management of these locations have been offered for 68 of these locations (AAI, 2000). For the revised list of 107 sites; 10 have undergone Phase II testing with 6 considered eligible for inclusion on the National Register of Historic Places (NRHP) and 4 judged to be ineligible; 58 are considered ineligible without testing, 29 are recommended for Phase II testing and 9 have been judged to need further examination before a recommendation can be made. Table 4-6 provides a summary of the status of the original 80 sites.

Three archaeological sites fall within the proposed National Guard 1,264-acre training and target area (sites 40CF257, 40FR199, and 40FR478), and none within the 154 acre impact area.

Site 40CF257 is located northwest of Roads 5 and G3-s. This site is not considered to be eligible for the NRHP.

**Table 4-6      Status of Recorded Cultural Resources Sites  
Arnold Air Force Base, Tennessee**

<b>Testing Recommended</b>	<b>No Further Work</b>	<b>No Recommendation</b>	<b>Tested</b>	<b>Excavated</b>
40CF056, 40CF057, 40CF124, 40CF239, 40CF241, 40CF254, 40CF259, 40CF265, 40CF266, 40CF267, 40CF268, 40CF270, 40CF271, 40CF272, 40CF273	40CF251, 40CF252, 40CF253, 40CF255, 40CF256, 40CF257, 40CF258, 40CF260, 40CF261, 40CF262, 40CF263, 40CF264, 40CF269	40CF123	40CF247 – not eligible	40FR223 – burials removed, no further work
49FR049, 49FR197, 49FR199, 49FR200, 49FR201, 49FR210, 49FR211, 49FR222, 49FR228, 49FR229, 49FR233, 49FR236, 49FR237, 49FR238, 40FR478	49FR194, 49FR195, 49FR196, 49FR213, 49FR214, 49FR215, 49FR216, 49FR217, 49FR218, 49FR219, 49FR220, 49FR221, 49FR224, 49FR225, 49FR226, 49FR227, 49FR230, 49FR231, 49FR232, 49FR234, 49FR235, 49FR239, 49FR240	49FR119, 49FR120, 49FR121, 49FR138, 49FR142, 49FR143, 49FR144, 49FR145, 49FR146, 49FR147, 49FR148	40FR209 – not eligible	

Site 40FR199 is located east of the junction of Roads 8 and G3-s. This site was first identified during shovel testing (Lanham, 1995). At that time a minimal amount of nondiagnostic lithic artifacts were recovered. This site is not considered eligible for the NRHP and no further work is recommended for it.

Site 40FR478 is listed as the Baxter Farm site. It was visible in the 1936 aerial photographs and was still an active farm at that time. At present, there are concrete steps and a cistern cover remaining on the surface. Artifacts including glass, metal, and ceramic materials were noted on the ground surface at the time of the survey in 2002. Bennett states in his report that this may be one of the best preserved sites on the base and he recommended it for Phase II testing.

No other archaeological sites have been identified in this area to date. Provided in Figure 4-8 is the status of the cultural resources Phase I survey and probability status as of 1 January 2004. This figure indicates that 501 acres of the proposed 1,264-acre license area have not been surveyed. The unsurveyed land is considered "low probability" for potential cultural resources. Phase I surveys would be scheduled in FY 2005 on all unsurveyed acreage that is proposed for surface disruption and has not been previously disturbed from Camp Forrest activities.

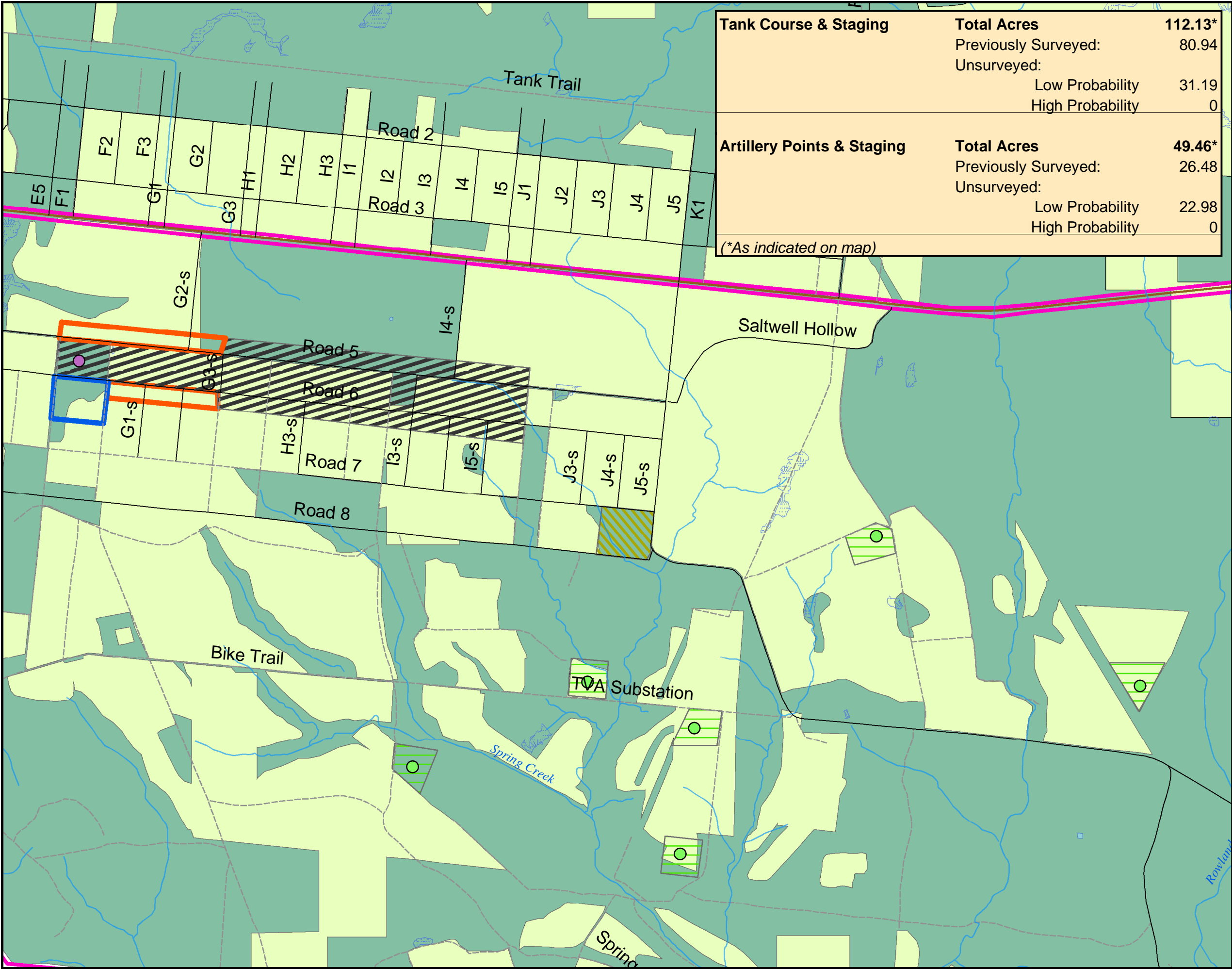
In accordance with Section 106 consultation with the Tennessee SHPO, the office was contacted 21 February 2003 concerning the potential impact of the proposed project on cultural and historical resources. The SHPO responded on 3 March 2003 and indicated that, "it is our opinion that there are no National Register of Historic Places listed or eligible properties affected by this undertaking."

Two of the sites are considered not eligible for the NRHP within the 1,264-acre proposed license area (personal communication, Mark Moran, 2002). The third site (40FR478) was scheduled for a Phase II survey in FY 04 to determine its eligibility. The proposed laser-firing tank range and artillery maneuver areas should not impact this site.

#### **4.8.2**      *Historic Resources*

In 1926, a National Guard summer camp, Camp Peay, was established on the outskirts of Tullahoma. The camp was named after Governor Austin Peay. An average of 1,500 troops came to Camp Peay for 2 weeks at the end of July and at the beginning of August each year (Bradley, n.d.).

In 1940, Camp Peay was chosen as a location for one of the nation's largest training centers by the U.S. Government in preparation for World



Tank Course & Staging	Total Acres	112.13*
	Previously Surveyed:	80.94
	Unsurveyed:	
	Low Probability	31.19
Artillery Points & Staging	Total Acres	49.46*
	Previously Surveyed:	26.48
	Unsurveyed:	
	Low Probability	22.98
	High Probability	0
(*As indicated on map)		

ATA Conservation



Cultural Resources

Site Survey and Probability Status

- Previously Surveyed
- Low Probability
- High Probability

TNARNG Current & Proposed Lease Area

- Artillery site
- Tower
- Artillery Point
- Artillery Staging
- Tower line of sight obstruction?
- Tank Course
- Tank Staging
- Tennessee Army National Guard Current & Proposed Training Area



0 500 1,000 2,000  
Feet

ATA - A Joint Venture Between  
Jacobs Sverdrup, Computer  
Sciences Corporation, and General Physics

Figure 4-8 Cultural Resources  
Site Survey and  
Probability Status

Arnold Engineering Development Center  
Arnold Air Force Base, Tennessee

War II. The state of Tennessee received money to improve National Guard training facilities.

Before the first phase of construction had been completed, the War Department ordered a change in the name of the camp. Governor Prentice Cooper suggested the camp be named after Nathan Bedford Forrest, a Confederate lieutenant general who had been born and fought in the area surrounding the camp. The name of the camp was officially changed to Camp Forrest in February 1941 (Bradley, n.d.). Camp Forrest was used as a training base until 1944.

In 1944, the role of the camp was reduced to a supply and equipment depot. In 1945, the only aspect of the camp that was growing, was the prisoner-of-war area. In February 1946, Camp Forrest was listed as inactive and, in May 1946, was placed under the control of the War Assets Corporation as an inactivated military base.

In 1950, construction of the Air Engineering Development Center, a test facility for the space program, was initiated at the former Camp Forrest (Bradley, n.d.). In June 1951, the center was renamed the Arnold Engineering Development Center (AEDC) in honor of General "Hap" Arnold (USAF, 1994d:30). In 1970, the TMD was licensed to use a portion of land on Arnold AFB for training at the rifle ranges. In 1974, the TMD received a license allowing use of portions of the former Camp Forrest and the airfield area for training.

Three cemeteries are located within the TTS area. No cemeteries are located in the proposed training areas.

In 1994, an archaeological reconnaissance survey was conducted at the selected areas of the former Camp Forrest training base by the Transportation Center at the University of Tennessee. Five historic sites were recorded within the former Camp Forrest World War II Military Training Base during the survey (Lanham, 1994). Sites 40FR199, 40FR200, and 40CF239 yielded historic material dated to the 1940s. Site 40CF241 was identified as the incinerator. Site 40FR240 was identified as a cemetery containing 140 or more burials and dated to the late 19th century and early 20th century. These sites are located on the TTS property, north of the proposed training areas.

A comprehensive Cultural Resources Management Plan (CRMP) was completed by Arnold AFB in April of 2000 (AAI, 2000). The CRMP is being updated to include surveys and evaluations for historic buildings and archeological sites.

In an 11 June 1996 letter, the Tennessee Deputy SHPO declared archeological sites 40CF239, 40CF240, and 40CF241 and sensitive areas along the wet weather streams, including Bobo Creek and Bluehole and Saltwell Hollows, to be off-limits to wheeled and tracked vehicle training activities. These areas would be marked in the field with appropriate off-limits signs. Final boundaries would be approved by the SHPO. Bobo Creek and Bluehole Hollow are located north of the proposed training areas. Saltwell Hollow is located east of the areas and would be crossed on the way to proposed artillery maneuver area 2. The road to this location is a well-traveled gravel road.

In the event of inadvertent discovery of historic resources, the TNARNG would cease all activities that might damage these newly discovered resources and notify the Arnold AFB Cultural Resources Manager.

#### **4.8.3**      *Native American Resources*

The southern middle Tennessee area was occupied by the Overhill Cherokee until early 1700s. In 1716, Colonel George Chicken was appointed superintendent of the Native American Trade by South Carolina and, in 1725, he visited the Overhill. This was the beginning of a series of British visits to secure Cherokee assistance against the French (Chapman, 1985:103). The Cherokee-British alliance was tenuous and eventually relations became strained because of a series of conflicts. The French and Indian War ended in 1763 with the British in control of most of eastern North America. Most of the Cherokee population fled to the Overhill area.

The distribution of the Native American record across the Arnold AFB landscape is strongly patterned. Extensive scatters of lithic materials dating to all of the known cultural-historic periods except the Paleo-Indian are documented for the area across the terrace landscape surrounding Woods Reservoir. Across the upland landscape, the surface distribution of artifacts is much more scattered and much less extensive (AAI, 2000). The Proposed Action is limited to the upland landscape.

The Arnold AFB area may contain resources that are sensitive to Native American groups. These resources may include prehistoric and historic villages, ceremonial areas, cemeteries, and burials (USAF, 1996). These areas are likely confined to the major streams of the Elk and Duck River drainages. The upland areas are less likely to contain these resources.

Per the DOD Annotated Policy Memorandum, (DOD, 27 October 1999, Annotated Policy Document for the DOD American Indian and Alaska Native Policy), Arnold AFB has contacted all Native American Tribes that have some connection to the land and might be interested in establishing



government-to-government relations. Future consultation efforts would probably be conducted through one central contact, the United Southeastern Tribes. A total of 10 Native American tribes are included in this one central contact. Initial contact with these tribes is scheduled for April 2004 at Arnold AFB.

#### **4.9                   HAZARDOUS MATERIALS AND WASTE MANAGEMENT**

Hazardous materials and hazardous waste management activities at the TTS and Arnold AFB are coordinated with EPA, Region IV, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S. Code (USC) 9601-9675, as amended, and RCRA, 42 USC 9601-6992, as amended. In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare or the environment when released into the environment. All of the original 1,264-acre cantonment area of Camp Forrest is a RCRA management unit, which is in the process of site investigation/remediation. The Draft RFI work plan was prepared by CH2M HILL in June 2001. The plan includes those units identified in the 1,264-acre Camp Forrest cantonment area. This section summarizes the existing conditions related to hazardous materials and waste management, Installation Restoration Program (IRP) sites, underground storage tanks (USTs), aboveground storage tanks (ASTs), asbestos, pesticides, polychlorinated biphenyls (PCBs), and ordnance.

##### **4.9.1           *Hazardous Materials and Hazardous Waste Management***

Hazardous materials are stored and used at the TTS in connection with various administrative and industrial operations, including armored vehicle repair and routine maintenance, grounds maintenance, painting, and insect and weed control. The most commonly used materials include diesel and motor fuels, oil and lubricants, paints, thinners, adhesives, cleaners, lead-acid batteries, herbicides, hydraulic fluids, and solvents. Hazardous materials are not stored at the proposed training areas.

No hazardous waste is presently generated at the proposed training areas.

##### **4.9.2           *Installation Restoration Program Sites***

Since the initiation of IRP activities at Arnold AFB in 1982, one large area of potential environmental contamination known as the Camp Forrest area (OT-19, later changed to SS-19) has been identified and is being investigated for further action. A records search completed in September

1984 identified the site as an area of possible environmental concern. The proposed training areas are within SS-19.

IRP activities in the Camp Forrest area are being conducted in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and coordinated by the Air Force and the EPA, Region IV. Arnold AFB, rather than the TNARNG, is responsible for the cleanup of this site, which was contaminated prior to TNARNG use.

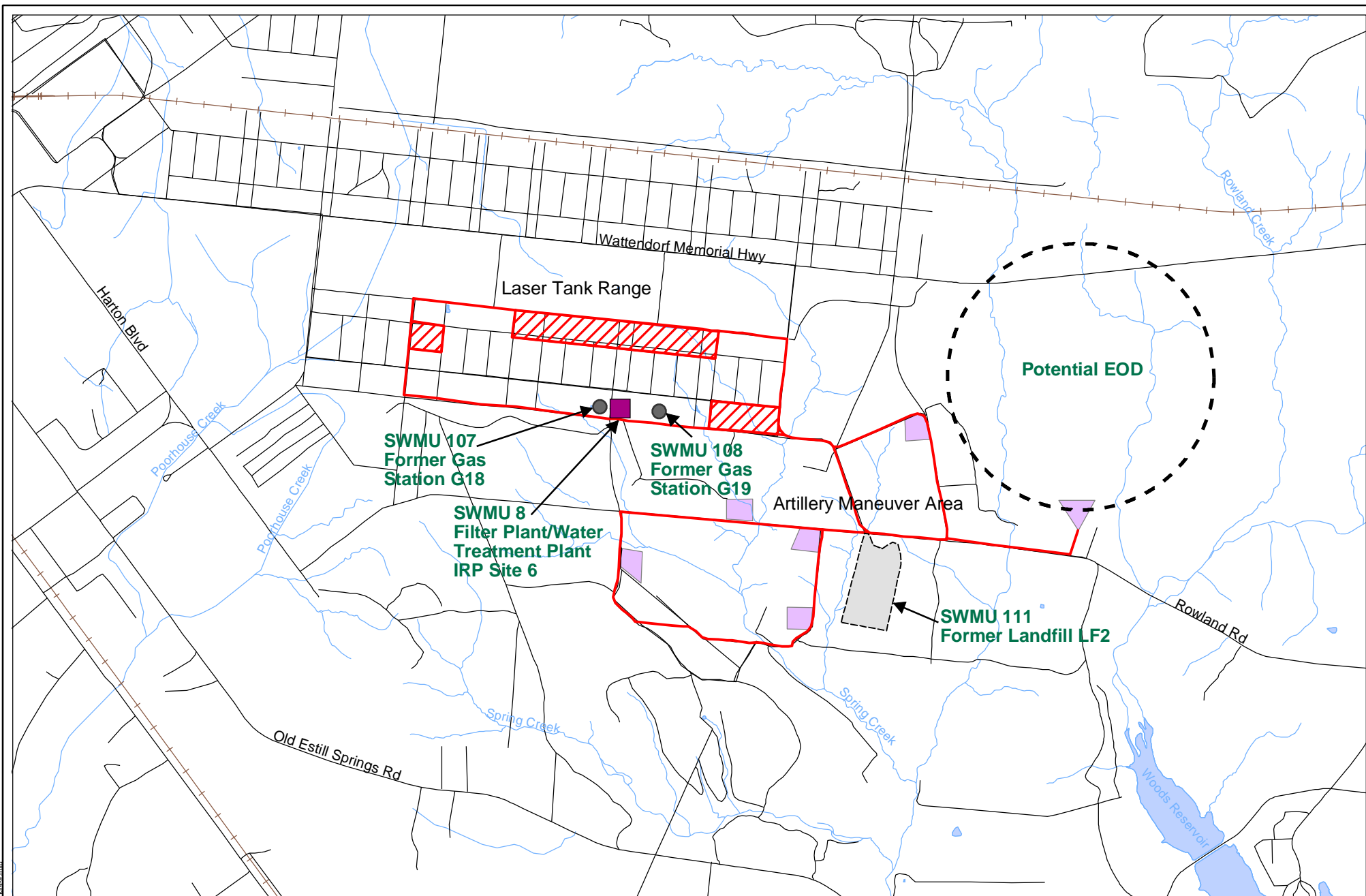
Within IRP site SS-19, a total of 85 areas of interest (AOIs) have been identified that would require further investigation by AEDC. Most of the potential contamination at the site is related to the use of petroleum-based fuels and lubricants. The AOIs include 35 motor pool areas, 20 gas stations, 3 large vehicle maintenance areas, warehouses, and a bulk storage fuel farm. Other potential sources of contamination not related to the use of petroleum fuels include an incinerator, the location of a former coal pile, the former filtration plant/water treatment plant (WTP), and several landfills.

In September 1994, the fieldwork phase of a confirmatory sampling investigation was initiated to evaluate any potential contamination and any current or future risks associated with the AOIs. The draft work plan was submitted to EPA Region IV for approval in April 1994. EPA Region IV commented and responses were included with the final work plan in January 1995. In 1997, the Draft RFI work plan was completed and comments were provided by EPA Region IV. The Draft RFI work plan was revised in 2001 and identified 16 Solid Waste Management Units (SWMUs) in the 1,264 acre Camp Forrest cantonment area that are being carried forward as RFI sites. Three of these sites are located adjacent to the proposed tank training area, and one landfill is located along the roads that lead to the artillery maneuver areas. The areas are identified as: SWMU 107 former gas station G18, SWMU 108, former gas station G19, SWMU 8 filter plant/WTP IRP site 6, and SWMU 111, Former Landfill LF2, Figure 4-9.

The proposed laser tank range would be in proximity to two contaminated sites: a former chemical treatment plant and an old gasoline station. Both sites are currently being remediated by USAF.

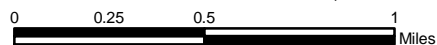
#### **4.9.3      *Underground Storage Tanks***

Former gas station G18 consisted of three 5,000-gallon USTs that were removed as a part of dismantling of Camp Forrest in the 1940s. Gas station G19 consisted of one 5,000-gallon UST that was removed at the same time. No features remain at these two sites. Groundwater has been sampled at these locations and VOCs were detected in groundwater wells



- Legend**
- Laser Tank Range
  - Road
  - Railroad
  - Stream, Creek, or River
  - Artillery Area

Figure 4-9  
RFI SWMU's  
Proposed Training Areas  
Arnold AFB Tullahoma, TN



**URS**

located near the former tank pits of G18. Due to the close proximity to the filtration plant, and other constituents detected in groundwater from releases from SWMU 8, groundwater remediation is currently taking place at G18.

#### **4.9.4**      *Aboveground Storage Tanks*

There are no active ASTs at the proposed training areas.

#### **4.9.5**      *Filtration Plant/Water Treatment Plant*

SWMU 8, the Camp Forrest former WTP, was later used as a chemical treatment plant and which received a variety of hazardous wastes. Sixty-nine groundwater monitoring wells and piezometers, and three groundwater extraction wells were installed and sampled in the area. These activities took place as part of a Phase II Field Investigation (Battelle, 1988), the Remedial Investigation/Feasibility Study (RI/FS) (Science Applications International Corporation [SAIC], 1991), RFI No. 2 (Hydrovision, 1996; CH2M HILL, 1999), and Interim Corrective Measures (ICM) work at SWMU 8. Four aquifer pumping tests were conducted, as well as slug testing of individual wells and capture zone studies of the extraction wells. The nature and extent was evaluated for a dissolved-phase chlorinated volatile organic compound (CVOC) plume that originated at SWMU 8. The CVOC plume, which extends through the southern portion of Camp Forrest along Spring Creek, ultimately discharges to Spring Creek from seeps and springs. The monitoring wells indicated that releases of BTEX occurred upgradient from SWMU 8 at former gasoline station G18, an AOI for Camp Forrest. However, the BTEX does not extend downgradient from SWMU 8 in the shallow and intermediate aquifers (Hydrovision, 1996).

#### **4.9.6**      *Asbestos*

There are two large asbestos debris sites and numerous small piles at the TTS where asbestos may be found mixed in with debris from demolished buildings from the Camp Forrest era. These sites are located in the southwestern portion of the TTS within (and are part of) IRP site SS- 19, but north of the proposed tank training area and artillery maneuver area. These areas have Asbestos-Containing Material (ACM) in the form of roofing tiles, insulation, pipes, and floor tiles, along with other construction debris (CH2M HILL, 2001).

Similar small debris piles may exist on the proposed training areas and contain ACM (personnel communication, Dennis Flat, 2002).

#### **4.9.7      *Pesticides***

Pest control is not practiced at the proposed training areas.

#### **4.9.8      *Polychlorinated Biphenyls***

Transformers are located only on the road ROW along Arnold Center Drive. Transformers are not located on the proposed training areas. One power relay station, owned by the Tennessee Valley Authority (TVA), is located approximately 1,500 feet south of artillery training area 2. This station is fenced and not in the path of the proposed training vehicle traffic.

#### **4.9.9      *Ordnance***

No ranges are presently located on the proposed training areas. The proposed tank range would use laser firing mechanisms. No live fire would be used with the tanks or artillery.

The proposed artillery training area may extend to an exploded ordnance (EOD) location. This location is east of the proposed tank range and east of the artillery maneuver areas. Artillery maneuver areas 1 and 2 may extend to the EOD area (personnel communication, Dennis Flat, 2002). The precise boundaries of the EOD area are not presently known. Characterization of this area is anticipated to be performed by USAF.

### **4.10              *SOLID WASTE***

No waste is presently generated in the proposed training areas.

One landfill was identified in the RFI for Camp Forrest, which is located south of the proposed artillery maneuver area. The former landfill LF2 (SWMU 111) is located south of the intersection of Road 8 and Rocky Road. Monitoring well installation, geophysical surveys, and observation of the land surface (field reconnaissance and aerial photographs) indicated that the landfill comprised a maximum area of approximately 23 acres. Ash, partly burned refuse, and sanitary landfill material were observed on the landfill surface (CDM, 1995). Ordnance was reportedly buried at Camp Forrest during dismantling of the camp (SSI, 1990). One practice claymore mine was found during the expanded preliminary assessment when woodlands were being cleared.

LF2 is located within the Spring Creek drainage basin at elevations of approximately 990 to 1,030 feet above mean sea level. An intermittent tributary of Spring Creek drains the landfill. Six monitoring wells at the



site were completed during drilling at depths ranging between 11 and 65 feet. The groundwater contained herbicides and metals above background levels. Additional sampling is planned for the groundwater (CH2M HILL, 2001).

#### **4.11 SOCIOECONOMICS**

The proposed training areas are located mostly within Franklin County on its northern border with Coffee County. The incorporated city of Tullahoma, located within Coffee County, is adjacent to the proposed training areas and approximately 1 mile east of the city.

The population in Franklin and Coffee Counties has increased moderately over the past 2 decades. Between 1970 and 1980, the population in Coffee County increased from 32,572 to 38,311, an increase of 18 percent, or 5,739. By 1990, the population of the county increased to 40,339, an increase of 5 percent or 2,028 over the 1980 population. By 2000, the population of Coffee County was listed as 48,014 (Tennessee Advisory Commission on Intergovernmental Relations [TACIR] CC, 2000). The 1980 Census lists the Franklin County population at 31,983. The 1990 population increased to 34,800, an increase of 9 percent. As of 2000, the Franklin County population was listed as 39,270 (TACIR FC, 2000). Between 1980 and 1990, the city of Tullahoma increased in population from 15,800 to 16,761, an increase of 6 percent. The full-time TTS staff consists of three persons. All TTS staff live off the Base in nearby communities.

The Agency for Toxic Substances and Disease Registry (ATSDR) characterized the demographics of the Base and the surrounding communities during a 2002 study. As of 2000, the total work force at the Base was approximately 3,250. These units are located in the southern part of the base near Woods Reservoir (ATSDR, 2000).

According to the 2000 census, 25.1% of the Coffee County residents were under the age of 18, 8.3% were between the ages of 18-24, 28.4% were between the ages of 25-44, 23.6% were between the ages of 45-64, and 14.6% were 65 years old or older. The median age in Coffee County was listed as 37.5 and there were 95.1 males per 100 females. As of 2000, 23% of the Franklin County residents were under the age of 18, 10.9% of residents were between the ages of 18-24, 26.4% were between the ages of 25-44, 24.4% were between the ages of 45-64, and 15.2% of the population was 65 or older. The median age in Franklin County was 38.1 and there were 94.8 males per 100 females.

Also as of 2000, the top three areas of employment in Franklin County were manufacturing (22.3%), trade (20.8%), and services (31.1%).

Similarly, in Coffee County the three highest employment percentages were manufacturing (24.7%), trade (23.5%), and services (29.4%). The per capita personal income in Franklin County was \$21,126 and the median family income was \$42,279. In Coffee County the per capita personal income was \$23,041 and the median family income was \$40,228.

There are no hospitals or schools located within the vicinity of the proposed training area, so no medical facilities or schools would be affected by proposed training operations.

The proposed training area is located near an industrial commercial area, a high-density mobile home area, a church, and a golf course, and is approximately 2 miles from a low-density residential area of Tullahoma. During the training process, it is likely that the surrounding areas would be affected by noise generated from the proposed training area; however, the training area would occur only occasionally on weekends, so noise disturbances would be kept to a minimum. In addition, recreational activities currently present on the proposed training area include bicycling and hunting. These activities would not be permitted during training operations, although they would only be occasionally disrupted due to the infrequent use of the training area. The military personnel to utilize the proposed area would be advised of the proper precautions to be taken, and experienced officers would oversee training activities. For public safety purposes, the proposed training area would be highly restricted and would not be accessible to the general public during training operations.

Approximately 28,500 acres of the total forested 29,050 acres of Arnold AFB are classified forestland. The Forest Management Plan of Arnold AFB identifies the forestland by type, consisting of 5,753 acres of pine and 23,297 acres of hardwood. The forest is managed under the principles of ecosystem management. The local logging industry and loggers utilize this sustainable resource, which benefits the local economy. The proposed training areas are managed by Arnold AFB. The forest within the proposed laser tank training area consists primarily of pine plantation (592 acres), with hardwood forest comprising approximately 15% of this area. The proposed tank training area is located adjacent to and south of the TWRA food plot area used as a public hunting area.

The proposed artillery training area includes small, 5-acre areas scattered over a larger area of the Arnold AFB property southeast of the proposed tank training area. The property on which the artillery sites are located includes generally an equal amount of pine plantation and hardwood forest. Agricultural land and food plots are also located in the area between artillery training sites 5 and 6.

#### 4.12 ENVIRONMENTAL JUSTICE

The following table represents the population percentages by race/ethnicity for Franklin and Coffee County as of the year 2000.

County	White	African American	American Indian/ Alaska	Asian	Hawaiian/ Other Pacific	Other	Two or more	Hispanic
Franklin	92.2%	5.5%	0.2%	0.4%	0.0%	0.6%	1.1%	1.6%
Coffee	93.4%	3.6%	0.3%	0.7%	0.0%	0.9%	1.0%	2.2%

The census data for Franklin County and Coffee County indicate that the poverty rates were 13.2% and 15.2% respectively. No information could be found linking the race/ethnicity and the poverty data to geographic distribution. The training area would be located on Arnold AFB property for practical reasons and most of people in this area would not be minorities according to demographic statistics. In addition, because the proposed training area would be located on military property, the distribution of income of personnel and residents on the property can be assumed to be relatively even (TACIR FC, CC, 2000).

#### 4.13 SAFETY CONCERNS

The proposed training areas contain no known restricted areas. The food plots and open land are used by the public for hunting, while the roads are occasionally used by bicyclists.

Arnold AFB coordinates with the TWRA, the agency responsible for scheduling hunting seasons, including the special hunts. At Arnold AFB, the big game hunts (for deer) preclude public hiking and bicycling use. During military training operations, barricades are placed across roads to ensure public safety.

A number of military training activities are conducted at the TTS to the north of the proposed training sites. Access to the small arms range is controlled by a locked gate. Access is permitted only to organized parties that have scheduled use of the small arms range in advance. The M-31 scaled artillery range, M-32 scaled mortar range, and the drop zone are barricaded during times of use to deny unauthorized public access.

The TNARNG strictly enforces safe use of equipment by all units and persons at the TTS. Safety training is provided to personnel in the classroom and in the field. Personal safety measures, such as hearing

protection, and protection against gases, fumes, high voltage, and radiation, as well as other measures, are addressed as standard operating procedures during routine exercises. Similar training is required of Base personnel for any activities related to the proposed training areas.

This section presents a discussion of the potential environmental consequences associated with the Proposed Action and alternatives. Impacts to the natural and human environment are evaluated for geology and soils, water resources, air quality, biological resources, cultural resources, noise, hazardous materials and waste management, solid waste management, land use, socio-economics, and safety concerns. Operational procedures would be implemented to reduce any potential adverse environmental impacts to biological resources as well as the other areas emphasized in this analysis.

## 5.1 LAND USE

### 5.1.1 *Proposed Action*

#### 5.1.1.1 *Impacts, (154 acres)*

The training activities would not significantly change the land use in the proposed training areas. Approximately 7 acres and 10,000 feet of road would be used for the tank training, while 42 acres and 22,000 feet of road would be used for the artillery maneuver areas during 4 to 8 weekends per year that would be coordinated with the Base to minimize the impacts to current land uses. The Proposed Action would reduce current land uses as well as land used as a buffer area around the training area for safety purposes. Access to the TVA Franklin County Substation Road would not be restricted during training, though access may be limited to the east side from Rowland Road. Training would not be conducted during the opening day of dove season to avoid impacts to the dove field managed by TWRA. Training would be scheduled for fall and spring months and may conflict with small and large game hunting. Training would be coordinated through Arnold AFB to TWRA to avoid the most desirable hunting weekends. During artillery training, biking and hiking would be restricted to alternate trails at Arnold AFB.

#### 5.1.1.2 *Tank Training Area, (102 acres)*

The tank training area would be located between Roads 5 and 7 in the South Camp Forrest cantonment area. The targets would be located between Roads 5 and 6 in the Camp Forrest area. A staging area for temporary parking of vehicles during training would be located on a 7-acre tract south of the proposed observation tower. Tanks would simulate fire from Roads 5 and 6 at targets between these two roads and within 100 feet north of Road 5 and 100 feet south of Road 6. Tanks would travel east



on Roads 5 and 6 while training and return on Road 7 to the staging area. Vegetation would be cut and maintained to a height of 3 feet in the 90-acre target area. Timber is currently grown in a portion of this area.

The Proposed Action would remove approximately 114 acres from timber production and could affect other resources including recreational use, such as hunting. The target area would be managed for wildlife habitat, specifically for Barrens habitat and Eggert's sunflower.

#### *5.1.1.3 Artillery Maneuver Area, (52 acres)*

The Proposed Action would include the use of approximately 30 acres (six 5-acre plots) as maneuver areas for artillery units and 12 acres for a staging area. The majority of these areas are open land and would not require additional clearing. Some of the land within these areas is new growth (less than 10-year old) loblolly pine. Other vegetation in the areas includes invasive species such as autumn olive, multi-flora rose, kudzu, and common privet. The present uses within these areas would be impacted during training weekends, although long-term use and use during the majority of weekends per year would not be impacted.

#### *5.1.1.4 Operational Procedures*

The tank and other vehicular traffic would be limited to the present roads at the proposed area with the exception of the staging areas. Use of the fringe areas would be prohibited. Laser tank targets would be constructed between Roads 5 and 6. These targets would occupy approximately 100 square feet of area each. These targets would be located on open land and would require line of sight to the firing positions. The line of sight would require the maintenance of vegetation along the sighted line to a height no greater than 3 feet.

### *5.1.2 No-Action Alternative*

#### *5.1.2.1 Impacts*

With no new training taking place, there would be no impacts on land use.

## 5.2 *AIR QUALITY*

### 5.2.1 *Proposed Action*

#### 5.2.1.1 *Impacts*

Emissions resulting from the use of military and civilian vehicles for the Proposed Action are presented in Table 5-1. As a result of the increase in the number of vehicles, annual pollutant emissions would increase from very few tons emitted from occasional hunting and AEDC site personnel to a conservative maximum of 2.86 tons of hydrocarbons, 13.93 ton of carbon monoxide, 37.32 tons of NO<sub>x</sub>, 1.8 tons of particulate matter (PM), and 93.68 tons of fugitive PM from roads.

The most recent point source emissions inventory for Coffee and Franklin Counties (which includes AEDC and the city of Tullahoma) is presented in Table 5-2. The total gaseous pollutant emissions from vehicles that would utilize the proposed training sites was compared with the total Coffee and Franklin County point source gaseous emissions. This comparison indicates that emissions from the proposed training sites would contribute less than 3 percent to the pollutant burden for either County.

The PM<sub>10</sub> emissions are also available for these two counties. The PM<sub>10</sub> emissions generated by the Proposed Action would also be less than 5 percent of the county PM<sub>10</sub> emissions. Therefore, impacts on air quality from pollutant emissions from the Proposed Action would be negligible.

#### 5.2.1.2 *Operational Procedures*

Impacts are not expected to be significant from fugitive dust emissions; however, TNARNG would consider watering or other dust suppression measures on days when dust emissions are expected to be above normal.

### 5.2.2 *No-Action Alternative*

#### 5.2.2.1 *Impacts*

The No-Action Alternative would result in no new emissions produced by military equipment (Section 3.3). The emissions from the Proposed Action would be relatively small compared with the stationary source emissions in Coffee and Franklin Counties. Therefore, air quality benefits of the No-Action Alternative would be negligible.

**Table 5-1 Estimated Annual Pollutant Emissions Resulting from the Proposed Action  
Arnold Air Force Base, Tullahoma, Tennessee**

Vehicle	Exhaust Emissions (pounds/year)				Fugitive PM10 (tons/year)
	HC	CO	NOx	PM	
M1A1 Abrams Tank	1,658.18	8,093.51	21,714.29	1,046.23	21.54
HMMWV	781.71	3,730.91	9,771.43	488.57	63.94
Bradley Infantry Fighting Vehicle	442.18	2,158.27	5,790.48	279.00	3.42
FMTV	331.64	1,618.70	4,342.86	209.25	2.57
<b>Total (tons/year)</b>	<b>1.61</b>	<b>7.80</b>	<b>20.81</b>	<b>1.01</b>	<b>91.47</b>

Notes:

Emission factors from CARB "Uncontrolled Emission Factors for Pre-1988 Model Years" using 1988 data.

Sulfur content of .039% is so low as to be negligible. Therefore no values were calculated for SO<sub>2</sub>.

Training Scenario:

Four Weekends/Yr:	48 HMMWVs
	24 M1A1 Abrams Tanks
	24 Bradley Fighting Vehicles
Eight Weekends/yr:	18 FMTVs
	60 HMMWVs

On each training day, all vehicles were assumed to operate 12 hours.

Vehicle travel assumed to be 6 hrs/day at 20 mph.

**Table 5-2      *Emission Inventory for Point Sources (tons/year)***  
***Coffee and Franklin Counties, Tullahoma, Tennessee***

**Franklin County**

<b>Facility Name</b>	<b>CO</b>	<b>NOX</b>	<b>PM10</b>	<b>SO2</b>	<b>VOC</b>
The University of Tennessee Space Institute	12	71	20	192	2
East Tennessee Natural Gas Company	9	58	0	0	0
CKR Industries	0	0	0	0	24
<b>Grand Total</b>	<b>21</b>	<b>129</b>	<b>20</b>	<b>192</b>	<b>26</b>

**Coffee County**

<b>Facility Name</b>	<b>CO</b>	<b>NOX</b>	<b>PM10</b>	<b>SO2</b>	<b>VOC</b>
Arnold Engineering Development Center	117	147	21	101	38
Tennessee Dickel Distilling Company	1	8	0	0	939
Batesville Casket Company	1	7	1	0	501
B.F. Goodrich Aerospace/Cleveland	1	2	0	0	19
M-Tek, Inc.	0	0	0	0	119
Massillon Cleveland	0	0	0	0	158
<b>Grand Total</b>	<b>119</b>	<b>165</b>	<b>22</b>	<b>101</b>	<b>1774</b>

Source: U.S. Environmental Protection Agency, 1999

## 5.3 NOISE

### 5.3.1 *Proposed Action*

#### 5.3.1.1 *Impacts, Tank Training Area*

Tanks and other military vehicles, including MLRS (108 decibels on the A-weighted scale ), are stored in the motor pool area at the TTS. These tanks (Abrams and Bradleys) as well as some small support vehicles would mobilize to the proposed tank training areas for the laser firing exercises. Waggoner Park (an industrial park), high-density residential areas, mobile homes, and a church are located adjacent to Arnold AFB. At the park, noise from the M-113 armored personnel carrier (117 dBA) would be about 80 dBA from the TTS motor pool, which would cause intermittent annoyance when the vehicles are started and moved to the training area. Noise levels at other sensitive receptors may reach 70 to 75 dBA for a short period of time. The nearest receptors to the proposed training area would be the golf course on the west side of Camp Forrest. The noise levels would be greatly reduced as the tanks conduct their training exercises east of this location. The staging area where tanks and other vehicles would be staged is over 8,000 feet from the nearest receptor.

Noise sources within the proposed tank training area consist of various military combat vehicles moving over improved and unimproved roads. The major sources of noise from these vehicles are the engine, drive gears, and track. Because the tanks would not be fired at the training area, noise from simulated firing is not a concern. Wildlife species are anticipated to temporarily or permanently avoid the training areas due to noise sources.

#### 5.3.1.2 *Impacts, Artillery Training Area*

Noise levels at a distance of 50 feet from moving tracked vehicles ranges from 93 to 98 dBA. With normal wave divergence, these noise levels would be 53 to 58 dBA at a distance of 1 mile from the source. Background noise levels adjacent to Arnold AFB have been measured at 55 dBA. However, because the maneuver areas are surrounded by trees and vegetation, noise levels would be reduced at a higher rate than by wave divergence alone. With this added attenuation, at a distance of 800 feet, the noise levels would be about 45 to 50 dBA, and at 1,000 feet, levels would be about 35 to 40 dBA. The artillery pieces would be pulled by 2 ½-ton trucks. The artillery training areas would be over 10,000 feet from the nearest receptor. Tracked vehicles would not be used regularly on the proposed artillery range.



### 5.3.1.3 *Operational Procedures*

TNARNG would continue to limit armor and artillery training activities during traditional community Sunday morning quiet hours, holidays, and other similar occasions to prevent disruption of surrounding civilian activities. A noise complaint log would continue to be kept at the TTS to record any citizen complaints and to modify operations at the training areas, if necessary. The TNARNG would use laser recording targets. Simulation training systems would be used to the extent practical, reducing noise incidence.

A noise monitoring program would be initiated at sensitive receptors by the TNARNG if noise complaints are received. Noise complaints and data from monitoring stations would be provided to Arnold AFB periodically.

### 5.3.2 *No-Action Alternative*

Without the training proposed at the two new locations, the TNARNG would not be afforded the capability of advanced training techniques; however, no new noise due to training in the proposed areas would be produced. The reduction of noise levels from surface noise sources by trees and other vegetation would produce only minor changes in ambient noise levels (Section 3.6.1). The elimination of these noise sources would produce only negligible beneficial noise impacts.

## 5.4 *GEOLOGY AND SOILS*

### 5.4.1 *Proposed Action*

#### 5.4.1.1 *Impacts*

With the Proposed Action, there would be a negligible change to land surface contours. Tracked and heavy vehicles would be limited to gravel roads, staging areas, and maneuver areas. These areas would be graveled where needed and gravel would be added to the roads where needed to support the heavy traffic and control erosion. The project would not use mineral resources.

An increase in the use of roads by tanks in the proposed tank training area and by heavy vehicles, especially trucks, tanks, and other tracked and/or heavy vehicles in the proposed artillery maneuver area has the potential to cause disturbance on the roads and trails. A total of 49 acres (six 5-acre areas, 19 acres for the two staging areas) of open terrain training areas are proposed to be covered with gravel surface. This new acreage has been

used for wildlife habitat in the past. Maneuver activity in this area is expected to be of relatively low impact due to existing site conditions.

The severity of ground surface disturbance depends on many factors, including:

- Soil type
- Vegetation cover
- Slope of land
- Locations of drainage pathways
- Weather conditions
- Type of vehicles used
- Number of vehicles used
- Concentration of vehicles per area
- Frequency of use per area

The use of heavy vehicles could leave ruts or pack the soil down in unpaved roadways. Water would run off the compacted soil and concentrate along the roadsides where it may then erode into the roadway or cut a channel along the area next to the roadway. If the soil does not pack well, the traffic, especially vehicles with treads, can loosen the surface layer of soil and make it vulnerable to wind or water erosion. This process would add to the natural erosion of soil from water runoff during rains. Wind would remove soil and increase PM in the air. Approximately 600 to 700 feet of currently ungraveled road would be used in the proposed project. This road would be graveled prior to use. The roads that are unpaved would be reinforced with gravel.

Vehicles, including tanks and other tracked vehicles, have the greatest potential for soil disturbance, especially in the open space training areas and in low areas of unimproved roads. The weight of vehicles causes compaction, and excessive compaction could be a problem in some areas. Compaction reduces permeability, which decreases water infiltration and increases runoff.

Continued vehicular movement over a period of time would almost certainly disturb the topsoil horizon(s) to a depth of 2 to 12 inches. At present, the proposed 49 acres are not used for cropland, nor are they proposed for such activity. While gravel would be placed on this area, no permanent loss of farmland would occur.

#### 5.4.1.2

#### *Operational Procedures*

Overall soil disturbance is not anticipated to occur since the traffic would be restricted to the established roads and graveled staging or artillery maneuver areas. In the event off-road soils are disturbed, procedure (A) would be performed first, followed by procedure (B) or (C). Procedure (D) and (E) would then follow.

- A. Characterize the soils, compatibility, topography, drainageways, soils, and vegetative cover in areas where maneuvers are to be conducted. Rank the areas as to vulnerability to disturbance and erosion. The least vulnerable areas could be used for the heaviest training activities.
- B. Spread out the training exercises so that vehicles are sufficiently dispersed and would have less impact on a given locality at one time. After each exercise, restore the impacted area where necessary.
- C. Concentrate training exercises that use heavy or tracked vehicles on the hard surface roads that exist in the Camp Forrest area, and continue to use the same areas each time. After each use, restore as necessary.
- D. Follow best management practices for erosion protection, loosen, regrade, reseed (native species would be the desired seed type but other grasses may be used as long as they are not listed as invasive exotic species or nuisance weed species), and repair damage to the land surface and drainage routes. This action should be taken as soon as possible between training exercises, particularly if there is the threat of heavy rain or during dry, windy weather.
- E. Restrict the movement of heavy and/or tracked vehicles to designated established roads and trails. Restoration would be required, as needed, to keep roads, trails, and open-terrain areas in repair and control drainage.

#### 5.4.2

#### *No-Action Alternative*

##### 5.4.2.1

##### *Impacts*

With the No-Action Alternative, additional improved tank and artillery training would not occur. As a result, there would be no significant impacts on geology or soil resources.

## **5.5 WATER RESOURCES**

### **5.5.1 *Proposed Action***

#### **5.5.1.1 *Impacts***

With the Proposed Action, there would be a substantial increase in personnel using the Camp Forrest area south of Arnold Center Road. The proposed staging areas may include temporary use, but would be primarily used as a “parking lot” for the training vehicles and artillery equipment during training. The observation tower and targets would be the only permanent structures.

An increase in vehicular operations would increase the potential for spills of fuels or other fluids. For example, a spill from a ruptured tank could migrate downward to groundwater or could be added to surface flow during times when water is present in streams. Impacts would depend on the size and nature of the spill.

#### **5.5.1.2 *Operational Procedures***

All fueling would be controlled by fueling of vehicles on steel spill control systems with 6-inch walls. Proper maintenance of vehicles and operational safety measures would minimize the occurrence of fuel and oil spills and leaks. Prompt cleanup of spills would ensure that impacts to both surface- and groundwater would not be significant. It is not likely that soil erosion impacts could be entirely eliminated.

Procedures would include identification and use of areas for maneuvers that would be least likely to be disturbed by vehicular traffic, as well as avoidance of areas identified as most sensitive. Consideration would be given to rotation of maneuvers from one area to another. Drainage ditches and swales could be modified to act as siltation or catchment basins at the staging areas; however, the normal flow would be maintained to sustain wetlands.

### **5.5.2 *No-Action Alternative***

#### **5.5.2.1 *Impacts***

With this alternative, training activities would not occur. As a result, water use would not be required. There would be no potential for spills of harmful materials to groundwater or surface water. In addition, there would be no activity-caused soil erosion; therefore, less siltation would occur in streams and wetlands.

## 5.6 *BIOLOGICAL RESOURCES*

### 5.6.1 *Proposed Action*

#### 5.6.1.1 *Environmental Consequences*

With the Proposed Action, biological resources could be affected by noise as well as road mortality associated with the increase in the number of tracked and wheeled vehicles used for maneuvering and training exercises and the use of tracked and wheeled vehicles in the additional artillery maneuver training areas.

#### 5.6.1.2 *Tank Training Area*

The Proposed Action includes the use of 10,000 feet of existing roads in the tank training area, which would subject the roads to some additional surface disturbance. However, current conditions of these roads, which served as a motor pool area during WW II and now have gravel or paved surfaces, indicate that additional impacts would be low. The TNARNG would avoid sensitive habitats (e.g. wetlands, areas of protected species), which would reduce impacts from training activities. The Proposed Action may affect state listed protected species, particularly the northern pine snake (Bailey and Bailey, 2002). However, the effect is expected to be low, as they tend to avoid human activity and training would be conducted primarily in the late fall and early spring when wildlife activity is lower. The vehicular traffic in the tank training area and artillery maneuver area routes may result in an increase in road mortality of wildlife and state listed species.

In addition to the increased use of roads, laser tank targets would be constructed within wooded and open areas of the South Camp Forrest area. Prior to construction of the targets and staging areas, an endangered species survey would be conducted to determine the presence of Eggert's sunflower in the tank training area. It is anticipated that the construction of the site would take place within approximately 2 years of approval. Therefore, surveys would be conducted at that time to evaluate the current occurrences of Eggert's sunflower in these areas. The areas would be marked using fiberglass posts and metal signage. Vegetation management in the 90-acre target area may benefit the Eggert's sunflower as the area would be maintained by the TNARNG by mowing or prescribed fire and would provide habitat similar to nearby clear-cut areas.

In addition to Eggert's sunflower, the northern pine snake a state of Tennessee threatened species, was documented in the proposed training area in 2001 and 2002 studies. According to the TDNH database, the



northern pine snake habitat is pine forest. A recent study (Bailey and Bailey, 2002) indicates that the northern pine snake prefers open areas dominated by herbaceous and shrubby vegetation, including young pine stands before canopy closure. The proposed target area would be maintained as herbaceous and shrubby vegetation. This area would benefit the northern pine snake, as well as other species such as Henslow's sparrow (*Ammodramus henslowii*), a state of Tennessee species of special concern. Targets in this area would be placed so as to minimize interference with the management planning. State listed plant species also occur in the proposed training area. These species, *Agalinis pseudaphylla*, *Prunus pumila* and *Drosera brevifolia*, would be avoided.

The Proposed Action is not likely to impact the movement of migratory birds. The development of the training areas would involve the construction of staging areas and clearing of a limited amount of land. Only one structure, the observation tower, would be constructed. Based on the lack of disturbance of food plots and resting areas, impacts to migratory birds are expected to be minimal.

Wildlife in the proposed tank training area may be affected by noise or traffic during exercises. There would be an increase in noise, which would affect wildlife because the vehicles involved in training activities on the roads may be closer to the wildlife. Many species of wildlife avoid areas of intense human activity. This may cause increased stress, disrupt daily/seasonal behavior, and/or temporarily or permanently displace species from their habitat. Substantial amounts of noise may cause some species of wildlife to temporarily or permanently relocate to more desirable habitat that may already be at carrying capacity, which may lead to loss of individuals.

The proposed tank training area is adjacent to two jurisdictional wetland sites delineated by the USFWS (1993) that are protected under Section 404 of the Clean Water Act and Executive Order 11990. No sites are located on the proposed staging area or in the area of new laser targets or firing positions. Of these sites, one is adjacent to the target area; however, it is located off of the road and not in an area where targets or firing positions would be constructed. As suggested by the USFWS, site-specific buffer zones would be established around wetlands, which could be impacted by training. These buffers would serve as off-limits areas for vehicle operations. In addition, maintenance of roads and trails would return grades to natural contours soon after training, reducing the impact on drainage patterns into wetland areas.

The Proposed Action includes the use of 22,000 feet of existing roads in the proposed artillery maneuver training area, which would subject the roads to some additional surface disturbance. However, current conditions of these roads, which have gravel or hard surfaces (with the exception of approximately 700 feet of dirt road), indicate that additional impacts would be low. In addition to the increased use of roads, the maneuver areas would include six 5-acre maneuver sites where artillery pieces would be assembled and disassembled. These sites would require additional surface protection for use during wet weather. Access drives or short roads would also be required for these areas. The TNARNG would avoid sensitive habitats (e.g. wetlands, areas of protected species), which would reduce impacts from training activities.

As with the tank training area, the staging area and artillery maneuver sites would be surveyed for Eggert's sunflower prior to construction, and the areas would be marked using fiberglass posts and metal signage. Therefore, the potential to impact this species is considered to be very low. Any areas where protected species are located would be reviewed prior to construction and would be off-limits to maneuvers or construction.

Wildlife in the training areas may be affected by noise or traffic during exercises. There may be an increase in noise, which would affect wildlife because the vehicles involved in training activities on the roads and in the small maneuver areas may be closer to the wildlife. Many species of wildlife avoid areas of intense human activity. This may cause increased stress, disrupt daily/seasonal behavior, and/or temporarily or permanently displace species from their habitat. Substantial amounts of noise may cause some species of wildlife to temporarily relocate to more desirable habitat that may already be at carrying capacity, which may lead to loss of individuals. In the proposed artillery training area, impacts to wildlife are expected to be low due to the existing traffic on roads at the site, and the dense vegetation in the forested areas around each site.

The proposed artillery training areas do not contain jurisdictional wetland sites delineated by the USFWS (1998). No jurisdictional wetland sites are located on the proposed maneuver areas; however, drainages are crossed on the roads that connect the sites. As suggested by the USFWS, site-specific buffer zones would be established around wetlands (up to 100 feet) that could be impacted by training. These buffers would serve as off-limit areas for vehicle operations. In addition, maintenance of roads and trails would return grades to natural contours soon after training, reducing the impact on drainage patterns into wetland areas.

All vehicles would remain on existing roads and major trails, to avoid significant adverse impacts to wetlands, vegetation, and wildlife.

In addition, the following procedures and guidelines have been identified as potential operational procedures that would be used to protect and restore biological resources disturbed by the Proposed Action:

- Avoid known sensitive or unique biological habitats by marking as off-limits using fiberglass posts and metal signs (i.e., as simulated mine fields or simulated chemically contaminated areas to complement training);
- Maintain buffer zones (up to 100 feet) of naturally occurring vegetation around any wetlands;
- Avoid endangered, threatened, and candidate species habitat by marking as off-limits;
- Concentrate training during seasons when the movement of animals is the lowest, i.e. late fall and winter for cold blooded animals;
- In formal conference with the USFWS, the Conservation Plan for Eggert's sunflower would be followed to protect this species on the Base. Tank targets would only be located in pre-approved sites, sites would be surveyed for endangered species prior to construction, and surveys would be conducted the year prior to construction in order to acquire the most current distribution data of Eggert's sunflower;
- Implement measures to promote soil stabilization with native vegetation;
- Implement measures to control noxious weed invasion on disturbed sites;
- Train military personnel to avoid hitting wildlife on roads, including snakes and other reptiles;
- Survey and relocate all wildlife from roadways prior to each training weekend; and
- Continue coordination with the Base to avoid and/or minimize conflicts with hunting season activities (provide training schedule to aide in coordination). Arnold AFB would coordinate with TWRA and the AEDC Commander would decide which land use prevails if any conflicts arise.

## **5.6.2      *No-Action Alternative***

### **5.6.2.1      *Impacts***

With the No-Action Alternative, impacts to biological resources would occur only as a result of the current public use and future missions of Arnold AFB, which would be evaluated at that time, if needed.

## **5.7              *CULTURAL RESOURCES***

### **5.7.1      *Proposed Action***

#### **5.7.1.1      *Impacts***

The specific regulatory framework for the management of historic properties on lands managed by the USAF is provided by several Public Laws, as well as numerous federal and state agency regulations and publications. Also important for Cultural Resources Management (CRM) at Arnold AFB are two documents issued by the SHPO of Tennessee. These are Tennessee SHPO Standards and Guidelines for Archaeological Resource Management Studies (June 1995) by the Tennessee Division of Archaeology (TDA), which provides guidelines for various CRM activities, and Tennessee Historical Commission Review and Compliance Section Reporting Standards (Garrison and Smith, 1996). Procedures for ensuring compliance with these numerous regulations within the context of installation mission directives are provided in AFI 32-7065 (13 June 1994).

The April 2000 CRMP prepared by Arnold AFB and adopted by the TNARNG for the TTS was reviewed. The plan identified approximately 80 sites that are in various stages of review. Updated information provided by Arnold AFB has indicated that a total of 107 sites are in various stages of review. The updated information indicated that the tank firing range area includes archaeological site 40CF478. This is listed as the Baxter Farm site. It was visible in the 1936 aerial photographs and was still an active farm at that time. At present there are concrete steps and a cistern cover remaining on the surface. Artifacts including glass, metal, and ceramic materials were noted on the ground surface at the time of the survey in 2002. Bennett states in his report that this may be one of the best-preserved sites on the Base and he recommended it for Phase II testing. This site is scheduled for Phase II evaluation in FY 04 by Arnold AFB.

The artillery maneuver area is adjacent to sites 40FR218, 40FR234, and 40FR477. No further work was recommended for these sites.

There are no cemeteries in the proposed training areas. The impact to cultural resources from the proposed activities is considered to be negligible. The 2 April 2003 letter from the Tennessee SHPO indicated that the Proposed Action was not likely to impact cultural resources. However, since part of the Proposed Action involves a Real Estate license from the Air Force to the state of Tennessee, TNARNG, Arnold AFB would consult with the SHPO in the final stages of this NEPA process.

Per the DOD Annotated Policy Memorandum (DOD, 27 October 1999, Annotated Document for the DOD American Indian and Alaska Native Policy), Native American Tribes were contacted by letter dated 27 March 2003. No response was received within the 45-day response period. Arnold AFB would make contact with the tribes again during the final stages of this NEPA process to determine if there is any interest in these Proposed Actions.

Native American resources are anticipated to be scattered in the upland areas proposed for use by the training areas. Impacts to Native American resources are not anticipated as a result of the Proposed Action.

#### 5.7.1.2 *Operational Procedures*

In an 11 June 1996 letter, the Tennessee Historical Commission declared the following as off-limits to wheeled and tracked vehicles:

- Site-sensitive areas along the wet weather streams including Bobo Creek, Bluehole Hollow, and Saltwell Hollow in the TTS (boundary areas would be determined in concert with the SHPO); and
- Known sites to include 40CF239, 40CF240, and 40CF241 (sites would be identified to the TMD and marked in a way that would not draw attention that they may have archeological remains).

The Proposed Action would not impact sensitive areas along streams, and sites 40CF239, 40CF240 and 40CF241 are not located in the proposed training areas. The tank training area does not include any streams and the artillery training areas are not located adjacent to streams. The roads connecting the artillery sites cross some intermittent drainages; however, these areas would not be impacted other than where roads currently exist. Any inadvertent discovery during training would be immediately reported to the Arnold AFB Cultural Resources Manager.



## 5.7.2 *No-Action Alternative*

### 5.7.2.1 *Impacts*

With this alternative, potential impacts to cultural resources would not occur. Although some cultural resources could be lost as a result of natural erosion, Arnold AFB has an ongoing Cultural Resources site protection program that would protect these sites from significant degradation.

## 5.8 **HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT**

### 5.8.1 *Proposed Action*

#### 5.8.1.1 *Impacts*

Currently, the TNARNG does not generate hazardous waste at the training area sites. The proposed activities at these sites would not result in the generation of hazardous waste. In the unlikely event of fuel or petroleum releases, the waste products would be disposed of in accordance with the TNARNG Hazardous Waste Management Plan. With the Proposed Action, hazardous materials and petroleum products would still be stored and used at the TTS in connection with various industrial operations, including tank, artillery vehicles, armored vehicle repair and maintenance and grounds maintenance at the staging area. The most commonly used materials would include diesel and motor fuels, oil and lubricants, hydraulic fluids, and solvents. The TNARNG would continue to use these products, although at a higher level than currently used, because the number of tracked and wheeled vehicles allowed for maneuvering exercises would increase. The tracked and wheeled vehicles would not exceed the currently licensed maximum of 78 tracked vehicles and 45 wheeled vehicles. The number of vehicles would not increase; however, the training area would increase and the type of training would be modified to include the laser range.

The TNARNG would continue to follow established regulatory requirements of the EPA, Region IV, for storage and use of hazardous materials and storage and disposal of hazardous wastes. Hazardous materials used and hazardous waste generated at the TTS do not pose any public health risk if used in accordance with current federal and state regulations and disposed of in accordance with the Hazardous Waste Management Plan. The impacts are considered not significant.

No expansion of the training area into the Camp Forrest IRP and asbestos disposal sites would be permitted as this could expose soldiers to undue risk. Close coordination with the Air Force would ensure these areas are avoided.

The proposed laser tank range would be in proximity to two contaminated sites: a former chemical treatment plant and a former gasoline station. Both sites are being remediated by USAF. TNARNG would ensure, as part of the license agreement, that the USAF continues its remediation efforts at these two locations.

#### *5.8.1.2 Operational Procedures*

All fueling during training weekends would be done over spill containment systems. These systems are steel pans constructed with a 6-inch wall. Incidental releases would be controlled in these systems. As instructed on previous occasions, the TNARNG would ensure that its visiting units contact the Arnold AFB operations center immediately for instructions in the event of a hazardous material spill. Handling of hazardous materials and waste should continue in accordance with EPA and Air Force regulations and established procedures. Avoidance during training operations should minimize conflicts regarding the cleanup activities at the Camp Forrest IRP and asbestos disposal sites.

### *5.8.2 No-Action Alternative*

#### *5.8.2.1 Impacts*

The No-Action Alternative would result in no additional training capability for the TNARNG. There would be no additional risk from hazardous materials and waste management because the TNARNG would not use the new training sites. Remediation activities of the IRP site would continue. The impacts of these activities on hazardous materials and waste management would be negligible and not significant.

## *5.9 SOLID WASTE MANAGEMENT*

### *5.9.1 Proposed Action*

#### *5.9.1.1 Impacts*

With the Proposed Action, the TTS would continue to be served by the Arnold AFB solid waste collection and disposal program. All solid wastes generated at the training areas would be minimal and would be limited to potential garbage generated at the staging area. Waste disposal at the

staging area would be limited to non-hazardous waste. A small, 2- to 3-cubic yard dumpster would be located at the staging area and only used during training activities. During training activities in the area, solid waste would be collected, temporarily stored onsite, and removed at the completion of the disposal activities at the designated facilities. The TNARNG would continue to comply with the rules and regulations of this program. The training grounds would continue to be kept clean by the visiting personnel, with policing conducted by the permanent TTS staff. The project would not result in any adverse impacts.

## **5.9.2      *No-Action Alternative***

### **5.9.2.1      *Impacts***

With the No-Action Alternative, additional tank and artillery training would not occur. The No-Action Alternative would result in the generation of no additional solid waste.

## **5.10              *SOCIOECONOMICS***

### **5.10.1      *Proposed Action***

#### **5.10.1.1      *Impacts***

With the Proposed Action, new construction would occur at the proposed tank range for the observation tower, staging areas, and the 25 to 30 targets. Temporary employment for the construction of the tower, target structures, staging areas, and road improvements would be given to local contractors. The number of permanent TTS staff would continue at three. The staff would reside off the Base in the nearby communities. The establishment of the training areas would result in the loss of 114 acres of commercial forest. Much of the pine forest is presently affected by the northern pine beetle and has been cut to reduce the spread of the pest. The present use of the food plots as annual dove hunting fields would not be changed and the training would not be conducted during the opening weekend days that the food plots are used for dove hunting. Training would be scheduled so to avoid other hunting weekends as much as possible as coordinated through Arnold AFB. The artillery sites do not presently have commercially valuable timber; however, these sites would take a small area (less than 30 acres) out of potential use. The TNARNG estimates that the additional training capability would bring approximately an additional 10,000 personnel to the present 30,000 to 50,000 personnel into the area for training annually. This would, in-turn, increase spending in the local economy.

## **5.10.2**      *No-Action Alternative*

With the No-Action Alternative, the benefits to businesses in Tullahoma and Manchester from the additional weekend users of the TTS and the proposed training areas would not occur, resulting in the loss of some revenue. Local logging, recreational use, and hunting would not be affected.

## **5.11**              **SAFETY CONCERNS**

### **5.11.1**      *Proposed Action*

#### **5.11.1.1**      *Impacts*

With the Proposed Action, the current safety measures and procedures of the TNARNG, together with the hunter safety laws and vehicle code of the state of Tennessee, would continue to directly protect the members of the general public lawfully engaging in hiking, bicycling, and hunting activities at the TTS, including persons participating in the special hunts. The safety measures would also protect the permanent and visiting military personnel. Personnel safety measures, such as hearing protection and protection against gases and fumes, high voltage, radiation, and other measures, are routinely taken in accordance with the standard operating procedures of the Army and Air Force.

#### **5.11.1.2**      *Operational Procedures*

Horizontal construction projects of engineer construction units would include inspection of all improved roads for hard-surface damage and scheduling all repairs in a timely manner. The TNARNG would continue to take personnel safety measures in accordance with the standard operating procedures of the Army and Air Force. Any instances involving hunters or pedestrians straying onto the training area during a training event would be reported by the TNARNG to the Air Force. Additional signage and road barricades would be put in place if these occurrences warrant such actions to keep unauthorized personnel out of the area during training.

### **5.11.2**      *No-Action Alternative*

#### **5.11.2.1**      *Impacts*

With the No-Action Alternative, additional specialized tank and artillery training would not occur. The land and facilities of the Camp Forrest area

and proposed artillery training areas would continue to be used for natural resource management and recreation activities.

**5.12            *IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT  
OF RESOURCES***

An irretrievable commitment of resources would involve the consumption of energy and materials. Energy would be expended in the form of diesel and motor fuels and oil and lubricants for tracked and wheeled military vehicles during the specialized military training exercises. Electricity would be used at the developed facilities, consisting of the cantonment and motor pool facilities. The major commitment of materials would occur during the periods of military exercises and would include water for fugitive dust control, batteries for vehicles, tires for wheeled vehicles, and steel tracks for tracked armored vehicles. The Proposed Action would facilitate combat readiness of the TNARNG by providing additional specialized training adjacent to the TTS, while reducing the need for travel to distant, out-of-state, overcrowded training areas, resulting in a reduction in transportation costs and impacts to energy sources.



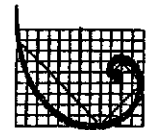


Environmental  
Resources  
Management

7106 Crossroads Blvd.  
Suite 228  
Brentwood, TN 37027  
(615) 373-3350  
(615) 373-2392 (Fax)

March 12, 2002  
\\ermwest \lbrs3-12-02

Dr. Lee A. Barclay, Ph.D.  
Field Supervisor  
U.S. Department of Interior  
Fish and Wildlife Service  
446 Neal Street  
Cookeville, TN 38501



**ERM.**

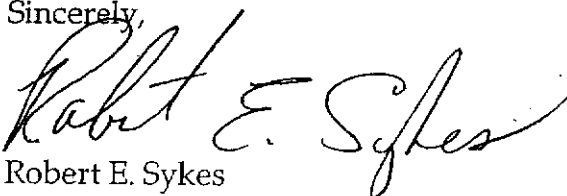
Dear Dr. Barclay:

ERM Southeast, Inc., is preparing an Environmental Review Report for the Tennessee Army National Guard. The site being reviewed is situated near the central portion of the Arnold Engineering Development Center and located on the Tullahoma and Capitol Hill Quadrangles. A portion of the quad is attached showing the site.

The site was reviewed by a walkover investigation on February 14, 2002, and found to consist of hardwoods, pine stands, and idle fields.

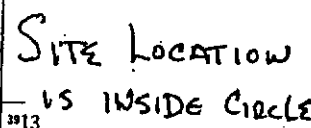
The purpose of this letter is to request a review of any threatened or endangered species that may occur on or near this site. If you have any questions or need further information, please do not hesitate to call me.

Sincerely,

  
Robert E. Sykes

RES/gsq

37541 NE  
(MANCHESTER 86-NE)





# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

446 Neal Street  
Cookeville, TN 38501

March 27, 2002

Mr. Robert Sykes  
Environmental Resources Management  
Suite 228  
7106 Crossroads Blvd.  
Brentwood, Tennessee 37027

Dear Mr. Sykes:

Thank you for your letter and enclosure of March 12, 2002, regarding a request for information concerning federally listed species that may occur at a site on Arnold Air Force Base, Coffee County, Tennessee. The information is requested to assist in the completion of an Environmental Review Report for the Tennessee National Guard. Fish and Wildlife Service (Service) personnel have reviewed the information submitted and offer the following comments.

According to our records, the federally threatened Egbert's sunflower (*Helianthus eggertii*) may occur in the project impact area. A qualified botanist should assess potential impacts and determine if the proposed activity may affect the species. A finding of "may affect" could require initiation of formal consultation. We recommend that you submit a copy of your assessment and finding to this office for review and concurrence.

Specific information concerning the site can be obtained from Arnold Air Force Base's Natural Resources staff. It is suggested that you contact Mr. Mark Moran (931/454-4066) for additional assistance.

Thank you for the opportunity to comment on this action. If you have any questions, please contact Mr. Doug Winford of my staff at 931/528-6481, ext. 215.

Sincerely,

Lee A. Barclay, Ph.D.  
Field Supervisor

xc: Mark Moran, ACS Conservation

# ACS

A Joint Venture of CSC, DynCorp and GP

## Conservation

### MEMORANDUM

---

**Date:** 13 December 02

**To:** Mark Moran

**From:** Kevin Fitch and John Lamb

**Subject:** Pine Stand (MU) 7452

---

Management Unit (MU) 7452 contains several species of concern, one related project of concern, and is included in our current planning efforts. They are numbered below:

1. Eggert's sunflower (*Helianthus eggertii*) occupies approximately 80 % of this 80-acre pine stand (i.e., 64 acres). A salvage clearcut was completed in this loblolly pine (*Pinus taeda*) stand on 10 January 02, following a southern pine beetle (*Dendroctonus frontalis*) infestation. Eggert's sunflower element occurrence (EO) 173B is included in our long-term monitoring efforts as directed by the USFWS. In 1999, baseline monitoring was conducted in a 25 x 25 meter index plot. Total stems were tallied in the index plot from 1999 to 2002. Results follow:

- 1999 – 552 total stems
- 2000 – 1107 total stems
- 2001 – 979 total stems
- 2002 – 1004 total stems

Additionally, the frequency distribution of total stems was computed to determine the spatial extent of the species within the index plot. A mean frequency of 48.5 % was recorded across the four monitoring years. Frequency peaked in August 2002 at 51 % and will likely increase due to the January 02 clearcut. Percent frequency indicates that the plant occupies 51 % of the index plot or 319 m<sup>2</sup> of a 625-m<sup>2</sup> index plot. Similarly, Eggert's sunflower EO 61A (located northeast of EO 173B and just North of Wattendorf HWY and West of Rifle Range Road) was clearcut in the summer of 2001, following a southern pine beetle infestation. Monitoring at this location indicated that Eggert's sunflower frequency increased from 38 % in 2001 to 53.5 % in 2002 (i.e., a 15.5 % increase in spatial distribution).

A gross estimation of total stems for the EO 173B is obtained by determining the total stems-per-meter<sup>2</sup> in the index plot and extrapolating it to the size of the element occurrence (i.e., convert acreage to m<sup>2</sup>). The number of stems-per-m<sup>2</sup> is then multiplied by the area of the EO. Results demonstrate that total stems within EO 173B are



# ACS

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## Conservation

estimated to be greater than 416,000 stems, distributed across the entire element occurrence.

2. Two deer browse exclosures and two paired control plots are also located in MU 7452. The goal of the White-tail Deer Browse project is to investigate the impact of white-tailed deer (*Odocoileus virginianus*) browsing on selected vegetative communities and rare, threatened, or endangered plant species on the base. Deer exclosures were established in representative vegetative communities, and paired with control plots. The Deer Browse plots located in MU 7452 were established to determine the impacts of deer browse on Eggert's sunflower in loblolly pine stands.
3. In a study of the Northern pine snake (*Pituophis melanoleucus melanoleucus*) in 2001, MU 7452 was found to be utilized by two of the six snakes that were tracked using radio telemetry in South Camp Forrest. The Northern pine snake is a former federal candidate species that is currently listed as threatened in Tennessee by the Tennessee Wildlife Resources Agency (TWRA) and as a species of management concern by USFWS.
4. MU 7452 was identified for grassland restoration during ACS conservation planning meetings in order to, in part, provide habitat for Henslow's sparrow (*Ammodramus henslowii*). The Henslow's sparrow is a former federal candidate species that is currently listed as deemed in need of management by TWRA, as a species of management concern by USFWS, and a high priority species by Partners in Flight. It currently occurs on the AAFB airfield and the model airfield, the latter of which is in close proximity to MU 7452.

## TNARNG LETTERHEAD

Date: 21 February 2003

Subject: Environmental Assessment [EA] of Proposed Licensing of Property at Arnold  
Air Force Base for Development of New Tank and Artillery Training Areas.

To Whom it May Concern:

The Tennessee Army National Guard (TNARNG) has received funding and approval from the National Guard Bureau for the preparation of an Environmental Assessment (EA) to document the environmental effects of a proposal to license 7,000 acres and construct a laser firing tank range and a six-station artillery maneuver area for the Tennessee Army National Guard. The land is located south of the present Tennessee Training Site (TTS) and includes the former Camp Forrest Cantonment Area (South Camp Forrest), as well as lands south of South Camp Forrest. In accordance with the National Environmental Policy Act, the TNARNG invites your participation in the review process in order to evaluate impacts to each alternative being considered.

The TNARNG needs the tank range and artillery maneuver areas to provide adequate training facilities for these operations to support the mobilization mission of the Tennessee Army National Guard. The development of these areas must be compatible with the short- and long- term plans of the AAFB. The proposed tank range and the artillery maneuver areas would allow the TNARNG to continue & improve its stated mission.

The proposed project location is shown on the enclosed maps. Your participation in the review of the Draft EA is welcome. If you have any information, comments and/or related questions, please contact James R. Orr, Project Manager, ERM Southeast Inc., 7106 Crossroads Blvd., Suite 228, Brentwood, Tennessee 37207 (615) 373-3350 [jim.orr@erm.com](mailto:jim.orr@erm.com) before March 21, 2003.

Sincerely,

Gregory W. Phelps  
COL, EN, TNARNG  
Deputy Chief of Staff, Engineering

Ralph Harder, C.P.E.  
February 21, 2003  
Page 2

Mailing List:

U.S. Army Corps of Engineers  
Attn: Ron Gatlin  
Regulatory Branch  
P.O. Box 1070  
Nashville, TN 37202

TN Dept. of Env. and Cons. (TDEC)  
Mr. Reggie Reeves  
Division of Natural Heritage  
8<sup>th</sup> Floor, L&C Tower  
401 Church Street  
Nashville, TN 37243

U.S. Fish and Wildlife Service  
Attn: Dr. Lee Barkley  
446 Neal Street  
Cookeville, TN 38501

TN Dept. of Env. and Cons. (TDEC)  
Mr. Paul Davis  
Div. of Water Pollution Control  
7<sup>th</sup> Floor, L&C Tower  
401 Church Street  
Nashville, TN 37243

U.S. EPA  
Attn: Heinz Mueller  
Chief of Office of Environmental Assessment  
61 Forsyth Street  
Atlanta, GA 30303

TN Dept. of Env. and Cons. (TDEC)  
Mr. Barry Stephens  
Div. Air Pollution Control  
9<sup>th</sup> Floor, L&C Tower  
401 Church Street  
Nashville, TN 37243

NRCS-U.S. Department of Agriculture  
Mr. Gus Jordan  
675 U.S. Courthouse  
801 Broadway  
Nashville, TN 37203

Mr. Mark Moran  
ACS  
1103 Ave B  
Arnold Air Force Base, TN 37389-1800

TN Wildlife Resources Agency  
Mr. Dan Sherry  
TWRA NEPA Contact  
P.O. Box 40747  
Nashville, TN 37204

TDEC/TN Historical Commission  
Attn: Joe Garrison  
Clover Bottom Mansion  
2941 Lebanon Rd  
Nashville, TN 37214

**United Southeastern Tribes (USET)**

**Native American Contacts – Federally Recognized Tribes**

**Eastern Band of Cherokee Indians Qualla Boundary**

Leon Jones Principal Chief  
James Bird (Tribal Preservation Officer)  
Post Office Box 455  
Cherokee, North Carolina 28719  
(828) 497-2822 FAX: (828) 497-2952

**The Cherokee Nation**

Chadwick Smith  
Chief  
Post Office Box 948  
Tahlequah, Oklahoma 74465-0948  
(918) 456-0671 FAX: (918) 458-0745

**United Keetoowah Band of Cherokee Indians**

Jim Henson, Chief  
Post Office Box 746  
Tahlequah, Oklahoma 74465

**Chickasaw Nation**

Bill Anoatubby  
Governor  
Rena Duncan,  
Director of Cultural Resources  
Post Office Box 1548  
Ada, Oklahoma 74821-1548  
(580) 436-2603 FAX: (580) 436-4287  
Cultural Resources (580) 332-8685

**Muscogee (Creek) Nation**

R. Perry Beaver  
Principal Chief  
Post Office Box 580  
Okmulgee, Oklahoma 74447

**Choctaw Nation of Oklahoma**

Gregory E. Pyle  
Chief  
P.O. Drawer 1210  
Durant, Oklahoma 74702

**Seminole Nation of Oklahoma**

Jerry G. Haney  
Principal Chief  
Post Office Box 1498  
Wewoka, Oklahoma 74884  
Historic Preservation Office:  
Post Office Box 1768  
Seminole, Oklahoma 74866-1768  
Gary White Deer,  
Historic Preservation Officer  
(405) 382-5194 FAX: (405) 382-6611  
email: [semnathist@renet.com](mailto:semnathist@renet.com)

**Eastern Shawnee Tribe of Oklahoma**

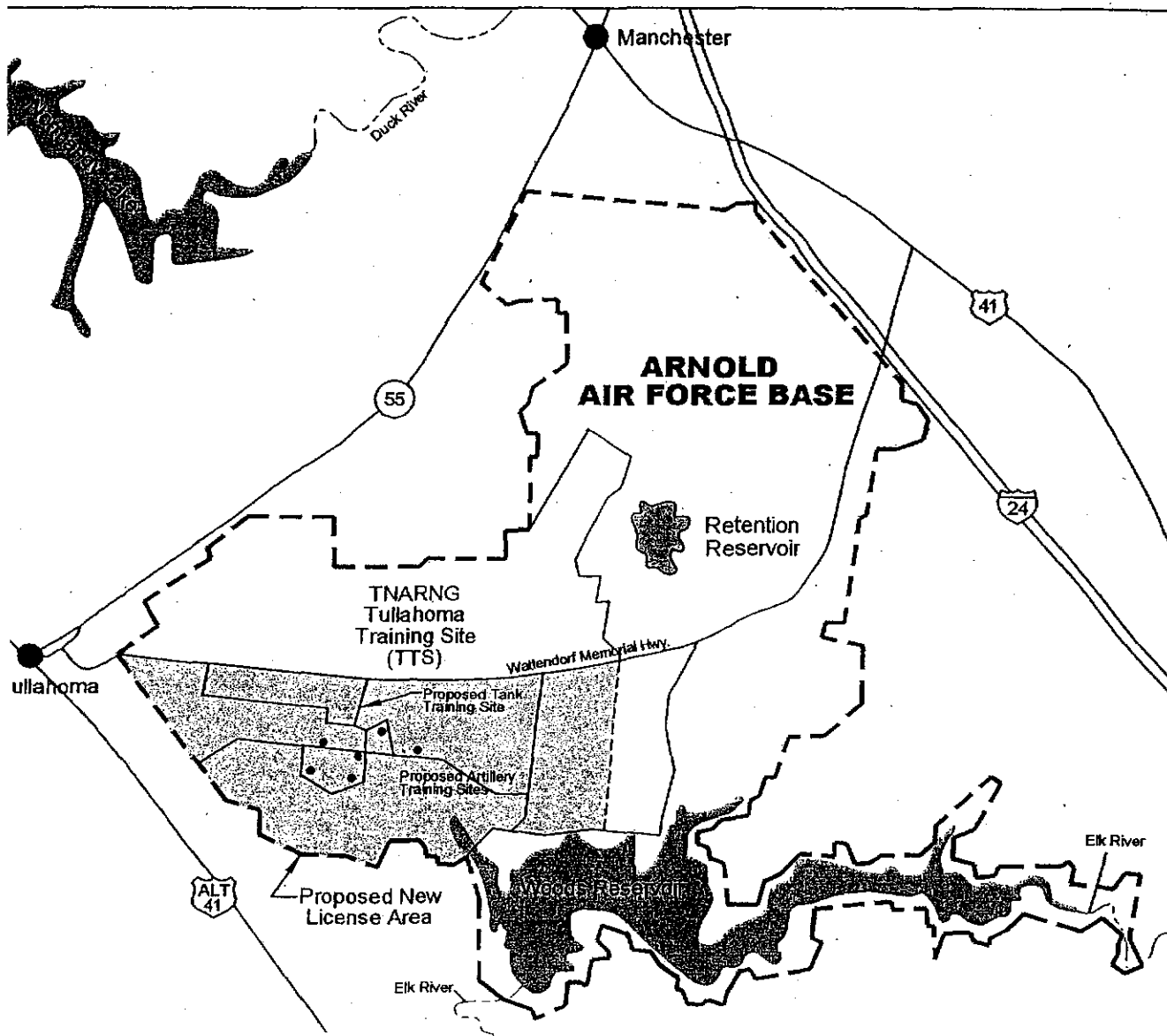
Charles D. Enyart  
Chief  
Post Office Box 350  
Seneca, Missouri 64865

**Poarch Creek Indians**


Eddie Tullls, Chairman  
5811 Jack Springs Road  
Atmore, Alabama 36502

**Quapaw Tribe**

Mr. John L. Berrey, Chairman  
P.O. Box 765  
Quapaw, Oklahoma 74363  
(918)-542-1853



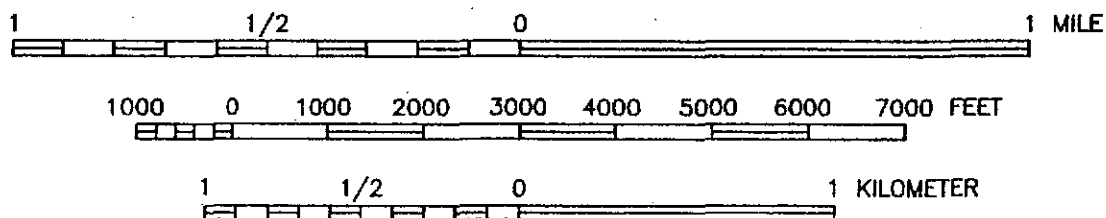
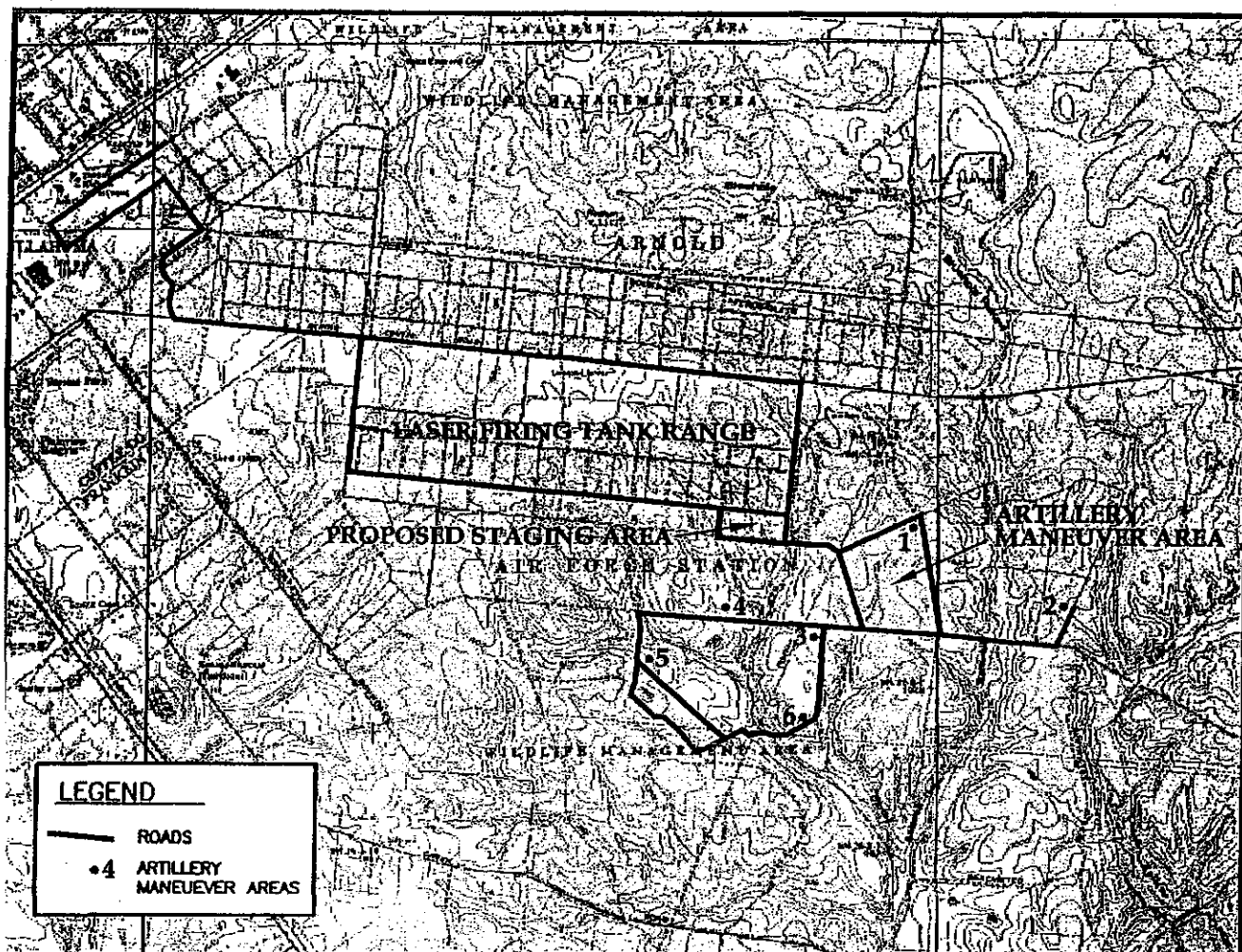
NOT TO SCALE

 **Environmental  
Resources  
RM Management**

**TULLAHOMA TRAINING SITE  
AND PROPOSED TRAINING LOCATIONS**  
AAFB  
TULLAHOMA, TENNESSEE

FIGURE

**2.3.2**



SCALE 1:24000



**Environmental  
Resources  
RM Management**

**LOCATION OF LASER FIRING TANK  
RANGE AND ARTILLERY MANEUVER AREAS  
TNARNG  
TULLAHOMA, TENNESSEE**

**FIGURE  
2.3.5**



Comment #	Location in the					Required *	Name of NGB Reviewer	Office of NGB Reviewer	Action Taken by State to Address the Comment
	Chapter	Section	Page	Paragraph	Sentence				
1	General						A. Dickson	NGB-ARE	The Proposed Action will be clearly defined in the document. The Proposed Action involves the construction of a laser-firing tank range and maneuver areas. The discussion of the affected environment will be more concise and not more in depth than the consequences. The tense of the document will be carefully reviewed to ensure that the document does not imply that a decision has already been made. Labeling will be reviewed to be consistent with land areas. The NGB NEPA handbook, 2002, was reviewed. A signature page and conclusions will be added to comply with document development.
2	ES						A. Dickson	NGB-ARE	The format of the Executive summary is changed to include "Introduction, Proposed Action, Alternatives, No Action Alternative, Environmental and Socioeconomic Issues and Concerns, and Conclusions.

Base, Tullahoma, TN

3	ES	Purpose and Need				Recommend it include what TNARNG proposes to construct (a range and maneuver area), where (AAFB south of TTS), why it is necessary to TNARNG (what are the current training facilities and why are they lacking?), what it entails (acreage, equipment, roads etc). Isn't a part of the proposed action to license a new training area? TNARNG should relate the need back to the training mission.	A. Dickson	NGB-ARE	The ES will be modified to include precisely what the Proposed Action is: What; a laser firing tank range and artillery maneuver area; Where, on 7,000 acres of the AAFB property south of the TTS; Why is it needed; The current training facilities do not include an area for the laser firing tanks which has an open line of site and adequate road network, and the available space for the network of artillery maneuver areas. The present tank and artillery training areas are located over eight hours from the TNARNG bases. The What it entails? - Licensing of 7000 acres of new property with the specific training improvement project to include, a 20 acre staging area, 30 acres for the artillery training area, using approximately 11 miles of existing roads. Structures that will be constructed will include gravel pads for the artillery maneuver areas and staging area, turn out firing stations for the tanks, and targets for the tank range.
4	ES	Purpose and Need				Suggest moving to last paragraph of Intro section.	A. Dickson	NGB-ARE	The last paragraph of the purpose and need section of the Executive Summary will be moved to the new "Introduction" section of the Executive Summary.
5	1	1	1-1	1		Is the proposed site within the Camp Forrest area or does it encompass the entire Camp Forrest area? Is there a map delineating the Camp Forrest area and the proposed site within that area?	A. Dickson	NGB-ARE	The Camp Forrest Cantonment Area will be depicted on Figures 1 and 2. The tank training site is contained within the former Camp Forrest area, while the artillery training area is south and east of Camp Forrest.
6	1	1	1-1	2	1	Suggest "The TNARNG is preparing an EA to document and determine whether or not there are any significant environmental effects of creating a laser firing tank range and a six-station artillery maneuver area on the proposed site."	A. Dickson	NGB-ARE	Agree to the revision

Base, Tullahoma, TN

7	1	1	1-1	2	Suggest using "proposed site" or "proposed range and maneuver area" instead of "site".	A. Dickson	NGB-ARE	Agree to utilize "proposed range and maneuver area" instead of "site"
8	1	1	1-1	3	Paragraph unnecessary and can be deleted, would be more applicable in the ES if you would like to keep it.	A. Dickson	NGB-ARE	Paragraph will be deleted.
9	1	2	1-2		Recommend answering: identify proposed action, include responsible parties, history leading up to proposed action, why TNARNG cannot meet its mission without proposed action, and the decision to be made regarding the proposed action.	A. Dickson	NGB-ARE	A new paragraph has been added to the beginning of this section. The second paragraph will be modified to where issues addressed above are not duplicated.
10	2				This chapter should only focus on the proposed action. Alternative Development, Alternatives, and No Action Alternative should be separate (Chapter 3).	A. Dickson	NGB-ARE	Chapter 2 focuses on the Proposed Action. Alternative Development, Alternatives, and No Action Alternative are separated into a new Chapter 3, and subsequent chapters have been renumbered accordingly.
11	2	1	2-1	1	Recommend deleting paragraph 1, it is repetitive and not appropriate for this section.	A. Dickson	NGB-ARE	Paragraph 1 deleted.
12	2				It is critical that this section be as clear and concise as possible. What is the acreage? I calculate 700 for the tank range, 20 for a staging area, 35 for maneuver plus 22,000 feet of roads. Wouldn't you lease that entire area and just have one total acreage? What is the status of the lease? The document indicates TNARNG is going to develop a range on AF property. Is this EA focusing just on the 700+ acres or the entire 7,000 acres? Are you developing the entire 7,000 acres? If so, why is this project separate? What kind of equipment is involved? Will you be constructing anything other than targets and amending roads? What about creating a parking lot is that gravel, asphalt?	A. Dickson	NGB-ARE	The total acreage of the Proposed Action is the licensing of 7000 acres of new property which will include 50.5 acres of property that will be used for targets, turnouts, and access roads at the tank range, staging area and maneuver areas, as well as the 11 miles of existing roads. The status of the licence will not be determined until the completion of the EA. The types of equipment involved will be discussed in greater detail. Targets, gravel parking lot and maneuver areas and road improvements are the only construction activities.

Base, Tullahoma, TN

13	2	Figures		Figure 2.3.1 does not show TTS, proposed action site, Camp Forrest area or AEDC area. Figure is needed with labeled roads that are mentioned in the chapter.	A. Dickson	NGB-ARE	A more accurate description of the features identified in Figure 2.3.1 is provided in the text, with the former Camp Forrest Cantonement Area added to the Figure. Figures 2.3.2, 2.3.3, and 2.3.4 are edited to include road names and location of staging area. AEDC is replaced with Arnold Air Force Base in Figure 2.3.2. The text is edited when Figures are referenced to describe more specifically what is included.
14	2	2 and 4		Alternatives should be is a separate chapter. What were the screening criteria and why were these alternatives not acceptable. Recommend changing tense so this section does not read as if decision has already been made. Indicate whether or not these alternatives will be further analyzed in the document.	A. Dickson	NGB-ARE	Alternatives are a separate chapter (3). Screening criteria and why they were not acceptable alternatives is discussed. Tense has been changed so this section does not read as if decision has already been made. The text indicates whether or not these alternatives will be further analyzed in the document.
15	3			Affected environment should focus on just the affected environment in other words, focus solely on the proposed action site within the context of AAFB and surrounding land uses. This will either be the 700+ acres or the 7000 acres depending on the proposed action. This chapter is far too long in comparison to the environmental consequences section. Geology, soils, water, air etc are excessive considering the proposed action.	A. Dickson	NGB-ARE	Affected environment will focus solely on the proposed training areas. This will be the 50.5 acres that will be affected by the proposed action. This chapter is reduced in length.

Base, Tulianoma, IN

16	3	5				Focus solely on the proposed action and document cultural resources within the proposed site. Is this area of interest to any Native American tribes? Please see comments from Beth Law for adequate coverage of this topic.	A. Dickson	NGB-ARE	The EA will focus solely on the proposed action and will document cultural resources within the area of the proposed action. No Native American Tribe issues were identified in the 2002 Cultural Resources study of AAFB. Native Americans were invited to comment and have not responded.
17	3	6				Where does proposed site fit into this? Sensitive areas? Nearest recipient?	A. Dickson	NGB-ARE	These issues are addressed in 3.6.1, Section 3.6 is a generic description of how noise may affect the environment. This section is reduced in length.
18	4					Wetlands in proposed site not addressed, water useage not addressed, letter from USFWS not addressed, concurrence from USFWS that a botanical survey not needed required, when will the consultation process with the USFWS begin? State listed species within the proposed site not addressed, , when will ACS review the proposed site for Eggerts sunflower habitat?, the relevant portions of the conservation plan should be in an appendix, INRMP should be referenced, ICRMP should be referenced. Please see additional comments from Derek Halberg.	A. Dickson	NGB-ARE	Wetlands are addressed in Section 4.5.3. Water useage (of which there will be none on the proposed site) is addressed in section 4.3.1.7, letter from USFWS will be addressed, concurrence from USFWS that a botanical survey will be addressed; The consultation process with the USFWS began in March 2002 as indicated on letter Section 5.0. ACS has reviewed the project site as part of there Eggert's sunflower management. There is a test plot for Eggerts in the clear cut area identified in the tank range. Target locations will be reviewed by a botanist to avoid Eggert's prior to construction. Coordination will continue when EA draft is circulated. The relevant portions of the conservation plan , if needed, will be in Appendix, INRMP and ICRMP will be referenced.
19	Conclusion/summary					Recommend adding a conclusion or summary.	A. Dickson	NGB-ARE	I recommend adding any additional conclusions or summary to the Executive Summary so as not to duplicate

Base, Tullahoma, TN

20	2	3				The opening sentence of Section 2.3 clearly indicates that the proposed action involves the licensing and use of 7000 ac of Arnold AFB to the TNARNG. But, the rest of the document seems to focus solely on the 700 acres upon which the laser range would be constructed and operated. The contractor needs to carefully reconcile the discrepancies regarding the "proposed action."	D. Halberg	NGB-ARE	The scope of work includes the licensing of 7000 acres, however the proposed training improvement project will only impact 50.5 acres.
21	3	4				Figure 3.4.1 clearly indicates that most of the area where the proposed laser range would be constructed is currently covered by loblolly pine plantations. Presumably, this area will need to be free of trees to allow line-of-sight to targets. But, section 2.3 fails to mentions the extent of timber clearing that will be required. Moreover, section 4.4 fails to discuss the consequences of the timber clearing.	D. Halberg	NGB-ARE	Section 4.4 indicates that the location of the targets, and subsequently the area that needs to be clear is mostly clear at this point as indicated in Figure 2.3.3. Timber clearing is not considered a significant requirement at this point.
22	4	4.1				Section 4.4.1 seems to indicate that the Eggert's sunflower is thriving in the portions of the proposed laser range that were recently clearcut. I would presume that the clearcutting of additional loblolly stands will create even more suitable habitat for the species, but Section 4.4.1 does not address this anticipated consequence.	D. Halberg	NGB-ARE	I do not see the inference to "thriving"; the text suggests that there is a "potential" for Eggert's Sunflower habitat to develop. The clear-cut area (80 acres) is designated as Eggerts habitat, approximately 20 % (16 acres) does not have Eggert's. The targets and access road will occupy less than 0.5 acre and will not impact populations of Eggert's on AAFB as surveys will be done prior to target placement. The text will be edited to clarify that the potential impacts to Eggert's will be minimal.



Base, Tullahoma, TN

23	General				<p>It is clear that the proposed laser range would "affect" the federally listed Eggert's sunflower. This is based on the information presented in sections 3.4.3 and 4.4.1, figure 3.4.4, and the letter from the USFWS to the EA contractor dated 27 Mar 02. As stated in the letter from the USFWS, if we conclude that our proposed action "may affect" the sunflower, we are obliged to prepare a Biological Assessment and submit it to the USFWS to initiate Formal Consultation with them pursuant to Section 7 of the Endangered Species Act. Unfortunately, the author of the EA seems to discount this potential effect in section 4.4.1 of the EA. Recommend that you determine what actions have been taken by the TNARNG since the 27 Mar 02 letter was received from the USFWS. From past experience, we will be unable to reach a FNSI for this EA until the Formal Consultation is concluded with the USFWS. This process is concluded when the USFWS issues a Biological Opinion to us outlining mitigation measures that are required and recommended to lessen our potential impacts to the species as the result of our project. Please inquire</p>		D. Halberg	NGB-ARE	<p>The area identified in Figure 3.4.4 as Eggert's habitat within the proposed area was clear cut in 2002 and Eggert's appear to be disturbed based on site visits. The targets proposed for this area will be placed only where Eggert's do not presently exist, or where there will be a minimal take of Eggert's.</p>
24	3	3.5			<p>Need to add verbiage - Memorandum, Department of Defense (DoD), 27 October 1999, subject: Annotated Policy Document for the DoD American Indian and Alaska Native Policy (DoD Annotated Policy). Discuss the process TNARNG will take to determine which (if any) of the Federally-recognized Native American Tribes will be contacted and why. List the POC from the Tribe(s). (if applicable). Include correspondence to the tribe and any correspondence received from the Tribe. If no correspondence is received then TNARNG must follow up with phone calls and create a Memorandum For Record (MFR) indicating who they spoke to, when they spoke to them and what they said.</p>	*	B. Law	NGB-ARE	<p>The 2000, Cultural Resources Management Plan, which includes the project site, indicated that no Native Americans were known at the proposed site. Native American tribes have been contacted and the point of contact will be included. The DoD Annotated Policy verbiage will be in this EA. Example: Per the Memorandum, Department of Defense (DoD), 27 October 1999, subject: Annotated Policy Document for the DoD American Indian and Alaska Native Policy (DoD Annotated Policy).</p>
25	3	3.5	3-21	3	<p>Provide TN SHPO concurrence letter stating none of these sites are considered National Register eligible on the proposed training areas.</p>	*	B. Law	NGB-ARE	<p>Coordination with SHPO was completed March 3 with a letter from SHPO indicated the project is in compliance with Section 106.</p>
26	3	3.5	3-21		<p>Discuss if the proposed training sites have any structures on it that are fifty years or older.</p>		B. Law	NGB-ARE	<p>Structures 50 years old or greater were not identified in CRMP.</p>

Base, Tullahoma, TN

27	3	3.5	3-22		Discussion is needed regarding what TNARNG will do in the case of inadvertent discovery? Ex. TNARNG will follow the procedures outlined in the Standard Operating Procedure (SOP) on this topic, SOP #?.	B. Law	NGB-ARE	Discussion will be added regarding what TNARNG will do in the case of inadvertent discovery. I will review this EA again to assure proper verbiage has been included regarding inadvertent discovery.
28	4	4.5	4-9		Add discussion regarding Native Americans - DoD Annotated Policy	B. Law	NGB-ARE	Discussion regarding Native Americans has been added.
29	ES and 1.1				This real estate action should be a license (not a lease) since it is from another Federal agency. Page ES-1 and 1-1 states "This property is presently on Air Force property and is not a part of the present 6,895 acres leased to the TNARNG".	K. Okeefe	NGB-ARE	The proposed action will be considered a license.
30	2	3			Page 2-3 states, "The TNARNG proposes to license approximately 7,000 additional acres for the purpose of creating a laser firing tank range and an artillery maneuver area for the TNARNG." Is this acreage a misprint - should it be 700? An EBS was done in 2001 that included this area. This area does have environmental concerns: RFI Solid Waste Management Units (SWMU)(from old gas stations) adjacent to firing range area and another SWMU (landfill) adjacent to the proposed roads. Also near the proposed property is a SWMU (from Filter Plant/Water Treatment Plant) that caused TCE/PCE contamination. Additionally the EBS indicates there are multiple lawsuits pending against Arnold Air Force Base, open and non-specific. Since this is a license, the Air Force retains responsibility for all ongoing environmental remediation efforts, however the TNARNG should be aware of them as they could potentially impact construction timelines and/or mission operations.	K. Okeefe	NGB-ARE	The land in the Proposed Action is 7000 acres of new lease property, the training project on this land will impact only 50.5 acres.
31	General				I checked with ARI and they have not received a request for this license yet. It could be that TNARNG wanted to ensure the EA supported their plans before they went ahead and requested the license. However, TNARNG does need to submit the proper real estate request information to NGB-ARI before signing any license agreements.	K. Okeefe	NGB-ARE	Since this is a license, the Air Force retains responsibility for all ongoing environmental remediation efforts, the TNARNG is aware of them as they could potentially impact construction timelines and/or mission operations.
32	General					K. Okeefe	NGB-ARE	TNARNG does need to submit the proper real estate request information to NGB-ARI before signing any license agreements.

Base, Tullahoma, TN

33	General				Errata should state what was changed, not what will be changed. Please review preliminary draft comments and address those that were not sufficiently addressed.		A. Dickson	NGB-ARE	In many cases this includes relocation of text, paragraphs that are too lengthy for an Errata sheet, preliminary draft comments "have been" changed.
34	Cover				Recommend removing contractor logo from cover and side of document. Suggest the TNARNG logo on the front cover instead. A sentence stating "prepared by ERM" in small font is acceptable on the front cover. Also recommend changing the title of the document to clarify that the analysis is of the proposed new training area.		A. Dickson	NGB-ARE	recommendations noted
35	Signature Page				Missing from document.	*	A. Dickson	NGB-ARE	A signature page has been added.
36	TOC				Suggest correcting page for the ES to read ES-1.		A. Dickson	NGB-ARE	suggestion noted
37	Acronyms				The Acronym and Abbreviation list should be located after the Table of Contents. Recommend reviewing document to verify that acronyms are used appropriately throughout document, a brief review showed that many titles were acronymed more than once, not acronymed initially or acronymed and then later spelled out.		A. Dickson	NGB-ARE	Acronym and abbreviation list will be located after the TOC, acronyms will be checked in the text.
38	ES and Section 1 Intro				Both sections should indicate if this is a joint EA with the Air Force and whether or not it will have a joint FNSI.	*	A. Dickson	NGB-ARE	This is a TNARNG EA
39	ES		ES-11	1	Is the document an Air Force document or National Guard or joint? Missing the reference 32 CFR Part 651 as an implementing regulation. The line "...direct that the Air Force consider environmental consequences..." should state National Guard instead of Air Force or include both depending on the type of document.	*	A. Dickson	NGB-ARE	This is a National Guard EA, 32 CFR Part 651 is included in the implementing regulations. Air Force changed to National Guard in line 6.
40	ES		ES-11	2	Suggest including "Tennessee Army National Guard (TNARNG)" in front of Tullahoma Training Site.		A. Dickson	NGB-ARE	suggestion taken
41	ES		ES-12	1	Suggest changing first sentence to read "This Environmental Assessment (EA) documents the environmental effects of a proposal to license 7,000 acres from AAFB and construct a laser firing tank range and a six-station artillery maneuver area for the TNARNG".		A. Dickson	NGB-ARE	suggestion noted
42	ES		ES-31	2	Recommend changing "severe adverse effects" to "significant adverse effects".		A. Dickson	NGB-ARE	suggestion taken

Base, Tullahoma, TN

43	ES		ES-3	1		Suggest stating which environmental and socioeconomic issues/concerns were positively and negatively effected by the proposed action directly, indirectly or cumulatively and which were not analyzed. This paragraph also contains mitigation measures and they should be labeled as such.	A. Dickson	NGB-ARE	suggestion noted
44	1	1	1-1	2	1	Suggest changing "of creation" to "with development of"	A. Dickson	NGB-ARE	suggestion taken
45	1	1	1-1	2	7	Unclear/confusing sentence, suggest deleting or rewording: The proposed site for development currently is utilized for food plots, timber production, and open areas.	A. Dickson	NGB-ARE	sentence deleted
46	1 & 2					Recommend combining the information in the following sections: 1.1 first paragraph, 1.3, and 2.1 first paragraph and locate them in Section 1.3. This combined section should reference 32 CFR Part 651 (National Guard AR 200-2 equivalent as the AR has not been published by the Army yet).	A. Dickson	NGB-ARE	32 CFR Part 651 referenced in section 2.1, no changes to other paragraphs.
47	1	2	1-1	1		This paragraph should not be in the purpose and need section, more appropriate as the Intro. Recommend moving to first paragraph in Intro of 1.1, make more succinct or even combine with 1.1 paragraph 2. Last sentence is confusing, suggest deleting unless the formal EA being referred to is in addition to this EA.	A. Dickson	NGB-ARE	Last sentence deleted.
48	1	2	1-2	3	1	Suggest changing sentence to read "The present access to training ranges is limited to Fort Knox and Fort Campbell in Kentucky, a minimum 8 hour travel time from unit armories which reduces available training time;....."	A. Dickson	NGB-ARE	suggestion taken
49	2	1	2-1			An intro section is not necessary and para 2&3 are redundant, recommend combining info and having the section just begin with the Proposed Action.	A. Dickson	NGB-ARE	Introduction deleted
50	2	Figure 2-1				Suggest using a transparent overlay of the Camp Forrest Cantonment Area.	A. Dickson	NGB-ARE	suggestion noted
51	2	Figure 2-2				Suggest using a transparent overlay to indicate areas within the former Camp Forrest area that will be utilized for the tank and maneuver areas. The general vicinity was previously seen in Figure 2-1, recommend zooming into the proposed new license area only and giving more detail such as the name of roads being referenced in the document.	A. Dickson	NGB-ARE	suggestion noted

Base, Tullahoma, TN

52	2	2	2-2	last	1	Suggest deleting "approximately" as the number of firing positions and targets should be known.	A. Dickson	NGB-ARE	specific number not known
53	2	2	2-3	2	last	The staging area is 20 acres, what is there currently ie clearcut, food plot etc.?	A. Dickson	NGB-ARE	According to land use maps, pine fores.
54	3	1.1	3-1	2		Recommend moving this paragraph to the beginning of 3.1.2.	A. Dickson	NGB-ARE	recommendations taken
55	3	1.1	3-1	1	last	Suggest adding a reason that this alt will not be analyzed further ie. Area not available, additional costs to project, increased env consequences etc, therefore, this alternative will not be analyzed further in this document.	A. Dickson	NGB-ARE	Paragraph moved to 3.1.2, which indicates that the alternative will not be analyzed further.
56	3	1.2	3-1	1	2	Suggest including the type of habitat to be disturbed whether it is forested, food plots etc rather than saying the env effects are unknown.	A. Dickson	NGB-ARE	New roads would result in grading of forested areas, agricultural fields/food plots and previously undisturbed habitat.
57	3	2	3-2	2	1	Suggest deleting "potentially"	A. Dickson	NGB-ARE	potentially deleted
58	3	2	3-2			Suggest adding a statement that says something along the lines of "due to env consequences, additional cost, area not available etc, these alt's will not be further analyzed in this EA"	A. Dickson	NGB-ARE	increase impacts to natrua resources" added to 3.2 p-3, s-2
59	3	3	3-2	1		Mimic the ES. Does the no action include not leasing? Tie no action into not meeting mission requirements, even include effects of increased travel etc.	A. Dickson	NGB-ARE	manuevers...and would therefore not meet the requirements of the mission of the TNARNG. The armored bigrades will continue to travel over 8 hours to present training sites which will result in an higher cost of mobilization and reduce the time available for training.
60	4		4-1	1		Affected environment is the 7,000 acres of leased property to include a footprint of 750 acres for the two projects, therefore, the affected area is much more than the 50.1 acres and 22,000 ft of road. The analysis must address the entire project.	* A. Dickson	NGB-ARE	The disturbed area will include 50.5 acres and 22,000 feet of road, reference to 750 acres has been deleted.
61	4	1.1	4-1	1		Suggest deleting all but first sentence in this paragraph, the important info was elevation that is repeated in the 3rd paragraph.	A. Dickson	NGB-ARE	taken

Base, Iulanoma, IN

62	4	2.3	4-4	1	2	Sentence is confusing--are you referring to previous construction within Camp Forrest cantomment area or that there has been construction in the proposed site and when it says "site" is that referring to the proposed site or Camp Forrest as a whole?	A. Dickson	NGB-ARE	delete "at the site" and add "in the past"	
63	4	3.3	4-4	7		Suggest deleting as this additional info doesn't add to EA.	A. Dickson	NGB-ARE	taken	
64	4	3.1.4	4-7			Recommend shortening this section, para 5&6 are the most relevant.	A. Dickson	NGB-ARE	Shortened Para 1, 3, 4, deleted Para 7 and 8.	
65	4	5	4-13			Recommend deleting first para, redundant info. Suggest putting para 2 under vegetation and para 3 under wildlife.	A. Dickson	NGB-ARE	deleted first para, placed 2nd para in 4.5.1, and deleted third para.	
66	4	6.2	4-20			Only the last 5 para are relevant to the document but the history of the training site is really interesting but not typically incorporated into this type of EA.	A. Dickson	NGB-ARE	Deleted first 4 para's, shortened 6, 8, and 9.	
67	4	6.3	4-23			First 3 para are irrelevant albeit very interesting. Recommend omitting. This section must also include verbiage on the DoD Annotated Policy and include tribes that are or have ancestral ties to the area. See B. Law's comments.	*	A. Dickson	NGB-ARE	Para 1 shortened to include first sentence only, para 4 deleted. Verbiage added to the end of section, "Per the Memorandum, Department of Defense (DoD), 27 October 1999, subject: Annotated Policy Document for the DoD American Indian and Alaska Native Policy (DoD Annotated Policy), the TNARNG has contacted the Native American tribal counsel for Tennessee. There comments are included in the coordination section.
68	5	1	5-1	2		The 50.1 acres is proposed to be disturbed as a part of the proposed action, not "potentially".	A. Dickson	NGB-ARE	potentially changed to proposed.	
69	5	1.1.1	5-2	2	2	Suggest changing sentence to "The weight of vehicles causes compaction, and excessive compaction <i>could potentially</i> be a problem in areas"	A. Dickson	NGB-ARE	suggestion taken	



Base, Tullahoma, TN

70	5	1.1.1	5-2	3	Suggest adding a statement similar to the following "No current use of soils for farming purposes at xxxx (nor any proposal for such activity), no actual loss of active (or prime or unique) farmland soils would result from implementation of the proposed actions".		A. Dickson	NGB-ARE	change "prime farmland" to "well suited for cropland"; and change "could be severe" to "may occur". Add sentence: At present the proposed 50.1 acres are not used for cropland, nor are they proposed for such activity. While gravel will be placed on this area , no permanent loss of farmland will occur.	
71	5	4.1.1	5-6	1	Instead of putting acreage in parenthesis, the potential/range/most likely number of total vehicles at any given time would be more applicable.		A. Dickson	NGB-ARE	the range and likely number of total vehicles at any time will be added to the description (section 2.2).	
72	5	4.1.1	5-7	1	The following info should be a part of the proposed action section "The target will number approximately 25-30 and each will occupy approximately 100 square feet in area. The construction of these target will be done primarily in the location of the food plot area with a minimal number located in the recent clear cut".	*	A. Dickson	NGB-ARE	delete from this section add details to page 2-3 where it is stated.	
73	5	4.1.1	5-8		The following sentence does not make sense as an increased use of the area would be likely to increase wildlife impacts and it suggests that the new training area will be used infrequently, "In the proposed tank training area, impacts to wildlife are not expected to increase due to lack of substantial existing traffic on roads at the site, the infrequent use of the training area and the dense vegetation in the forested areas between the roads."	*	A. Dickson	NGB-ARE	sentence deleted	
74	5	4.1.1	5-9	1	6	See previous comment in regards to "low frequency of use of the training areas...."	*	A. Dickson	NGB-ARE	delete phrase, the low frequency of use of the training areas, and last sentence of para.
75	5	4.1.1	5-9	3	Address the tank trail that crosses the AEDC Powerline Barrens.	*	A. Dickson	NGB-ARE	The tank trail does not cross the AEDC powerline Barrens, however one the artillery training sites is close to a powerline area. This powerline area is not considered part of the sensitive powerline barren habitat and the sentence will be removed.	

Base, Tullahoma, TN

76	5	5			Reference the TNARNG regulations, documents, and SOP's from the ICRMP.	A. Dickson	NGB-ARE	The CRMP was done in agreement by the Air Force and not TNARNG, therefore the TNARNG material is not referenced. The CRMP is referenced.
77	4	5.1.	4-15		sci name for raccoon is lotor not rotor.	E. A. Young	NGB-ARE	changed
78	4	5.1.	4-15		change opossum to Virginia Opossum sci name is <i>Didelphis virginiana</i> .	E. A. Young	NGB-ARE	changed
79	4	5.1.	4-15		add American to Kestrel.	E. A. Young	NGB-ARE	changed
80	4	5.1.	4-15		Canada Goose not geese	E. A. Young	NGB-ARE	changed
81	4	5.1.	4-15		<i>Sturnus</i> not <i>Sturnus</i>	E. A. Young	NGB-ARE	changed
82	4	5.1.	4-15		Add Eastern to meadowlark	E. A. Young	NGB-ARE	changed
83	4	5.1.	4-15		add Northern to cardinal and sci name is <i>Cardinalis cardinalis</i> .	E. A. Young	NGB-ARE	changed
84	4	5.1.	4-16		add Northern to Pintail and Shoveler	E. A. Young	NGB-ARE	changed
85	4	5.1.	4-16		for Redhead sci name is <i>americana</i> .	E. A. Young	NGB-ARE	changed
86	4	5.1.	4-16		Bufflehead not Buffiehead	E. A. Young	NGB-ARE	changed
87	4	5.1.	4-16		Is common water snake = to Northern Water Snake <i>Nerodia sipedon</i> ?	E. A. Young	NGB-ARE	changed
88	4	5.1.	4-16		Eastern Racer not Black Racer	E. A. Young	NGB-ARE	black racer is correct
89	4	5.1.	4-16		sci name is <i>Bufo americanus</i>	E. A. Young	NGB-ARE	changed
90	4	5.1.	4-16		is the gray frog present Cope's Gray Treefrog ( <i>Hyla chrysoscelis</i> ), Gray Treefrog ( <i>Hyla versicolor</i> ) or both?	E. A. Young	NGB-ARE	<i>versicolor</i>
91	4	5.1.	4-16		sci name for copperhead is <i>Agkistrodon contortrix</i>	E. A. Young	NGB-ARE	is added
92	4	5.1.	4-16		Last sentence in this Section doesn't make sense as it relates to poisonous snakes.	E. A. Young	NGB-ARE	last half of the sentence deleted.
93	4	5.2	4-16		yellow bullhead sci name is <i>Ameiurus natalis</i>	E. A. Young	NGB-ARE	changed
94	4	5.2	4-16		logperch is one word	E. A. Young	NGB-ARE	changed
95	4	Fig 4-5			for NGB review it would be nice to know which species is represented by each dot.	E. A. Young	NGB-ARE	suggestion noted
96	4	Table 4-4			remove L: Listed from entire table, not needed.	E. A. Young	NGB-ARE	L removed
97	4	Table 4-4			(PS) what does this = under Fed of Sharp-shinned Hawk?	E. A. Young	NGB-ARE	partial status
98	4	Table 4-4			Omit R: Rare and S: Special concern since they are not used in table.	E. A. Young	NGB-ARE	R: removed, S: will remain

Base, Tullahoma, TN

99	4	5.4	4-18		Bats. Need more discussion as to when and where bats occur.	E. A. Young	NGB-ARE	Gray bats feed along small streams and hibernate in the Woods Reservoir Dam. Perennial streams are not crossed by the project and the Dam is not affected. Gray bats should not be affected by the proposed project.
100	4	5.4	4-18		Section 6 should probably refer to Chapter 6 since Section is used for Tech reports and Law.	E. A. Young	NGB-ARE	no change
101	4	5.4	4-18		Sentence with Section 6 isn't really needed if species is already known to occur there.	E. A. Young	NGB-ARE	sentence deleted
102	4	5.4	4-19		Following sentence: Indirect studies from... suggests that Eggert's population will increase... What studies? Need to cite them.	E. A. Young	NGB-ARE	sentence deleted
103	4	5.4	4-19		Why are plants in last para of 4.5.4 not in table 4-4? Suggest all T&E species at the TNARNG land and AFB be included in one table.	E. A. Young	NGB-ARE	AAFB Powerline Barrens will not be impacted by project, para deleted.
104	5	4.1.1	5-6		Noise: Can noise impacts be addressed better in this section, including relating to animals, especially think T&E.	E. A. Young	NGB-ARE	sentence added, "species are anticipated to temporarily of permanently avoid the training areas due to noise sources".
105	5	4.1.1	5-6		Sentence at end of para "Proposed action is not likely to affect state listed..." doesn't make sense because it includes to many areas and isn't necessarily true based on evidence presented in this DEA.	E. A. Young	NGB-ARE	"The proposed action is not likely to affect state listed species as they tend to avoid human activity. The vehicular traffic in the training areas may result in road mortality."
106	5	4.1.1	5-7		Will removal of food plot area impact species, including T&E?	E. A. Young	NGB-ARE	the food plot will not be removed
107	5	4.1.1	5-7		Need to better address and evaluate how trng activities would likely increase Eggert's Sunflower. See Halberg's comments.	E. A. Young	NGB-ARE	TNARNG will not likely increase Eggerts sunflower, ACS predicts that clear-cutting will.
108	5	4.1.1	5-7		May be an increase in noise? Seems quantifiable, should it be there will be an increase in noise and how much?	E. A. Young	NGB-ARE	Estimates of decibels are given in section 4.7
109	5	4.1.1	5-7		Should noise material here be included with 5.4.1.1, pg 5-6?	E. A. Young	NGB-ARE	5.4.1.1 introduces impacts to biological resources, 5.4.1.2 separates it between the tank and artillery training

Base, Tullahoma, TN

110	5	4.1.1	5-7		Following sentence: In the proposed....between the roads. Is confusing.	E. A. Young	NGB-ARE	sentence is on 5-8, and is deleted
111	5	4.1.1	5-8		If trng increases habitat for sunflower, why would areas be avoided where sunflower exists? This needs to be addressed better...how much disturbance is needed? Beneficial? Types? Etc. Again, reference Halberg's comments, inference is that activities can increase habitat for species and benefit.	E. A. Young	NGB-ARE	see Halbergs comments
112	5	4.1.1	5-9		Should noise material here be included with 5.4.1.1, pg 5-6?	E. A. Young	NGB-ARE	see response to comment 109
113	5	4.1.1	5-9		Last para concerning AEDC Powerline Barrens, please elaborate as to what the significance is for this area? How does it relate to the EA?	E. A. Young	NGB-ARE	para deleted, powerline is located east of proposed project.
114	T&E species General				Species and issues are not adequately addressed. Make sure Sec 7 consultation occurs as to activities, especially with sunflower and bats. Why doesn't the FWS acknowledge the presence of bats in their correspondence letter? Need to ascertain why.	E. A. Young	NGB-ARE	The important habitat for bats in the Woods Reservior Dam. Other important habitat including the dam are not found in proposed project area.
115	T&E species General				Correspondence Memo from Mr Morgan, 13 Dec 02 needs to be more incorporated into the EA, this could help demonstrate +/- relationships between the sunflower and trng activities.	E. A. Young	NGB-ARE	Moran memo is included in coordination section.
116	T&E species General				Need to clarify specifically as to effects of project on T&E species, good and/or bad, it may still require formal consultation, resulting in a BA and BO as per ESA. I'm inclined to believe from what I've read thus far that there is an impact as per Halberg's comments. Make sure an Admin record is kept and correspondence with FWS is placed in Appendix during all informal consultation.	E. A. Young	NGB-ARE	consultation has indicated a potential impact to Northern Pine Snake which will be elaborated on in the DEA.
117	2		2-2		105mm must be corrected to "155mm" (no 105mm in TN, only 155mm)	LTC Mason	NGB-ARF	105 changed to 155
118	4		4-22		deactivated must be corrected to "Inactivated" (Deactivate equipment, Inactivate structure such as military base)	LTC Mason	NGB-ARF	deactivated to inactivated
119	General				no impacts to Force Structure within the EA. ARF Concurrs	LTC Mason	NGB-ARF	okay
120	1	1		6	Sentence states that the TNARNG leases 6,895 from the Air Force. PRIDE indicates that the amount of land leased from the Air Force is 6700 acres.	M. Ponte	NGB-ARI	6895 acres is reported in 1996 EA of TTS

Base, Tullahoma, TN

121	1	3	4	Sentence states that the proposed action does not have the potential to effect infrastructure (and therefore does not require a section addressing impacts on infrastructure). However, it is stated several times in this document that roads will be impacted (and therefore require some improvement and maintenance) by traffic from heavy equipment and tracked vehicles. Will there be any impacts on the supporting infrastructure at Arnold Air Force or Tullahoma Training Site from the increase number of troops and vehicles coming to Arnold for training? Consider adding section that addresses infrastructure impacts.	M. Ponte	NGB-ARI	additional description will be added to section 2.2
122	General			There were no good descriptions of the mission of the TN ARNG and effected units. The January 2001 RDP has good descriptions of the TN ARNG and effected units and their missions. I <u>recommend incorporation of this information.</u>	MAJ Smith	NGB-ART	descripiton of the mission expanded in section 2.2.
123	Title			The proposed action is to acquire 7,000 acres and construct a tank range (non live-fire, laser) and artillery maneuver areas.	MAJ Smith	NGB-ART	agreed
124	General			The construction of the tank range has not been requested to ART-S and not supported in the January 2001 RDP (not listed as a project) and not supported by the 2003 NGB TIS or the AMRP. I recommend that TN update their RDP to add this project. The earliest that this range can compete for funding (programming) is FY10 unless done by minor construction with state programmed funding.	MAJ Smith	NGB-ART	This is not EA related
125	General			The artillery maneuver areas are supported by the 2000 LURS and 2001 RDP and should be completed with ITAM funding.	MAJ Smith	NGB-ART	This is not EA related
126	General			Above referenced document has been reviewed. It will be legally sufficient once issues identified in comments 127-140 have been addressed. Additional comments are intended to add clarity to the document. This EA requires extensive revision.	E. Morrison	NGB-JA	no comment
127	General			NGB-JA strongly recommends that the TN ARNG utilize the information in the March, 2002 NGB NEPA Handbook in preparing the next version of this document.	* E. Morrison	NGB-JA	recommendation noted

Base, Tullahoma, TN

128	ES					In the EXSUM, subsection 1.3 and subsection 2.1, briefly explain that USAF is the owner of the proposed range, TN ARNG will be amending its current license at Arnold AFB, and USAF, as installation host, will participate in this NEPA process and co-sign the FONSI that is expected to be the administrative finding for this EA.	*	E. Morrison	NGB-JA	Added: Currently the United States Air Force (USAF) is the owner of the proposed license property. The TNARNG will be amending its current license at Arnold AFB, and the USAF, as installation host, will participate in this NEPA process and co-sign the Finding of No Significant Impact (FONSI) that is expected to be the administrative finding for this EA.
129	4	8				The proposed laser range will include two contaminated sites; a former chemical treatment plant and an old gasoline station. Both sites are being remediated by USAF. TN ARNG needs to ensure that the USAF continues its remediation efforts at these two locations. This needs to be stated expressly in the license amendment and the EA (at subsection 4.8) needs to clarify this fact.	*	E. Morrison	NGB-JA	"The proposed laser tank range will in proximity of two contaminated sites; a former chemical treatment plant and an old gasoline station. Both sites are being remediated by USAF. TNARNG will ensure, as part of the license agreement, that the USAF continues its remediation efforts at these two locations." is added to 4.8 and 5.7
130	4	8.9	4-28			The statements on page 4-28 that the proposed TN ARNG training areas "...may extend to an exploded ordnance (EOD) location" is too vague. If the proposed training range is going to be built on an EOD area, say so.	*	E. Morrison	NGB-JA	According to Mr. Flatt this area has not been mapped yet; thus we do not know if we will be in it or not. A sentence will included "The precise boundaries of the EOD area are not presently known. Characterization of this area is anticipated by USAF."



Base, Tullahoma, TN

131	3					Include specific action screening criteria in Section 3.0.	*	E. Morrison	NGB-JA	The screening of the proposed project included the consideration of the present 6895 acre TTS site. This site lacked the adequate road network available at the South Camp Forrest area and was more highly populated with Eggert's Sunflower. Both of these considerations eliminated the TTS site as a likely alternative.
132	3					Does US Army have technical standards for laser training ranges? If so, they should be included as part of the screening criteria.	*	E. Morrison	NGB-JA	technical standards which were identified in the "concept of Operation" included the line of site distance to the targets, roads and staging area.
133	General					In subsection 1.3 and the first paragraph of subsection 2.1, 32 CFR Part 651, Environmental Analysis of Army Actions.	*	E. Morrison	NGB-JA	Environmental Analysis of Army Action (32 CFR Part 651) requires the National Guard to analyse the environmental consequences of this action. Added to section 1.3, section 2.1 was deleted due to redundancy.
134	4	5				In subsection 4.5, discuss the USAF and TN ARNG INRMPs that have been prepared for Arnold AFB.	*	E. Morrison	NGB-JA	The INRMP will be discussed and cited in this section

Base, Tullahoma, TN

135	General					The final EA needs to include a discussion that the TN ARNG has completed any necessary ESA §7 consultation with the US FWS for the endangered Eggert's sunflower. In the final EA, include a copy of the formal correspondence from US FWS indicating their determination that the TN ARNG has met its consultation requirements. The 18 Mar 03 letter received from the US FWS states that the TN ARNG's conclusion that the proposal is not likely to have an adverse effect on the Eggert's sunflower "...cannot be fully supported by current knowledge."	*	E. Morrison	NGB-JA	We must complete consultation with the US FWS. The final EA must include a copy of the formal correspondence from US FWS indicating their determination that the TN ARNG has met its consultation requirements. The 18 Mar 03 letter received from the US FWS states that the TN ARNG's conclusion that the proposal is not likely to have an adverse effect on the Eggert's sunflower "...cannot be fully supported by current knowledge."
136	5	5				In subsection 5.5, discuss the 27 Oct 99 Annotated Department of Defense American Indian and Alaska Native Policy. Indicate whether the TN ARNG's proposal "...may have the potential to significantly affect protected tribal resources, tribal rights, or Indian lands."	*	E. Morrison	NGB-JA	The Annotated Policy is in Section 5.5. It is my understanding that the TN ARNG has made contact with Native Americans, but that correspondence has not been forwarded to me at this time.
137	5	5				Also, in subsection 5.5, discuss the 2 Apr 03 letter received from the TN SHPO that confirms the SHPO's conclusion that the TN ARNG has concluded the NHPA §106 consultation process for this proposed action. Attach a copy of this letter to the final EA. Also, refer to the TN state ICRMP in this subsection to ensure that any ARNG cultural resources management requirements that may be triggered by this proposal are addressed.	*	E. Morrison	NGB-JA	SHPO letter is included in Section 6 and discussed in Section 5.5. The AEDC CRMP is discussed in this section.
138	6					In the next version of this EA, complete Section 6.0, Consultation and Coordination. Include a list of all agencies and organizations contacted. This section is currently blank.	*	E. Morrison	NGB-JA	All consultation with agencies is in Section 6. Consultation with agencies includes Native Americans, USFWS, and SHPO.

139	3	2				<p>The No Action alternative on page 3-2 indicates that if the TN ARNG doesn't implement this proposed action "The TNARNG would not have the training facilities to prepare for higher-level defensive maneuvers." (Emphasis added). What exactly are the referenced maneuvers? Is the TN ARNG unable to meet US Army standards for a cavalry regiment without this new training?</p>	*	E. Morrison	NGB-JA	<p>Added to section 3.3: The TNARNG would not lease 7000 acres from the Air Force. The location of the proposed site in the USAF property would remain undeveloped. The TNARNG would not have adequate access to the training facilities to prepare for higher-level defensive maneuvers of simulated fire on targets, operating and assembling equipment. The TNARNG would therefore not meet the requirements of their mission. The armored brigades will continue to travel over 8-hours to receive their training, increasing the cost of mobilization and reducing the time spent training. A two-hour drive time limitation is currently the standard for armored units, and other tank and artillery sites are highly used resulting in scheduling difficulties.</p>
140	5					<p>Some of the restrictions described in the "Operational Procedures" subsections in Section 5.0 are the equivalent of mitigation measures. Measures such as "All vehicles will remain on existing roads and major trails" (page 5-9) are significant. This would be a FONSI mitigation measure that, as an action that would reduce the impacts of the proposal to less than significant levels, would be judicially enforceable against the TN ARNG. TN ARNG needs to review each of the "Operational Procedures" subsections and determine which restrictions are mitigation measures that will create a Mitigated FONSI. Describe these measures in a separate Mitigation section in the final EA.</p>	*	E. Morrison	NGB-JA	<p>All "Operational Procedures" will be reviewed to determine what mitigation measures are identified. These mitigation measures will be included in a separate section if needed.</p>

Base, Iullahoma, IN

[illegible]





**TENNESSEE HISTORICAL COMMISSION**  
DEPARTMENT OF ENVIRONMENT AND CONSERVATION  
2941 LEBANON ROAD  
NASHVILLE, TN 37243-0442  
(615) 532-1550

March 3, 2003

Mr. James Orr  
ERM  
7106 Crossroads Boulevard  
Suite 228  
Brentwood, Tennessee 37027

RE: DOD, TNARNG LICENSE AT ARNOLD AIR BASE, UNINCORPORATED,  
COFFEE COUNTY

Dear Mr. Orr:

The Tennessee State Historic Preservation Office has reviewed the above-referenced undertaking received on Wednesday, February 26, 2003 for compliance by the participating federal agency or applicant for federal assistance with Section 106 of the National Historic Preservation Act. The Procedures for implementing Section 106 of the Act are codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

After considering the documentation submitted, it is our opinion that there are no National Register of Historic Places listed or eligible properties affected by this undertaking. This determination is made either because of the location, scope and/or nature of the undertaking, and/or because of the size of the area of potential effect; or because no listed or eligible properties exist in the area of potential effect; or because the undertaking will not alter any characteristics of an identified eligible or listed property that qualify the property for listing in the National Register or alter such property's location, setting or use. Therefore, this office has no objections to your proceeding with the project.

If you are applying for federal funds, license or permit, you should submit this letter as evidence of compliance with Section 106 to the appropriate federal agency, which, in turn, should contact this office as required by 36 CFR 800. If you represent a federal agency, you should submit a formal determination of eligibility and effect to this office for comment. You may direct questions or comments to Jennifer M. Barnett (615) 741-1588, ext. 17. This office appreciates your cooperation.

Sincerely,

Herbert L. Harper  
Executive Director and  
Deputy State Historic  
Preservation Officer

HLH/jmb





# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

446 Neal Street  
Cookeville, TN 38501

March 18, 2003

Colonel Gregory W. Phelps  
Deputy Chief of Staff  
Department of the Army  
Houston Barracks, 3041 Sidco Drive  
Nashville, Tennessee 37204-1502

Dear Colonel Phelps:

Thank you for your letter and enclosures dated February 27, 2003, concerning the Environmental Assessment (EA) for the proposal to license 7,000 acres, construct a laser firing tank range, and construct a six-station artillery maneuver area for the Tennessee Army National Guard. All sites are located on Arnold Air Force Base, Arnold Engineering Development Center (AEDC), Coffee and Franklin Counties, Tennessee. The U.S. Fish and Wildlife Service (Service) has reviewed the information provided and have the following comments.

The Service recommends that all vehicular movement be restricted to existing gravel, asphalt, or concrete roads or turn-arounds. As referred to in the EA, existing logging roads will also be used to establish and maintain targets. Since Eggert's sunflower (Helianthus eggerti) occurs within the disturbed sites, existing logging roads should be surveyed to determine the occurrence or presence of potential Eggert's sunflower habitat prior to use. The frequency/extent to which the roads will be used should be based on the results of the proposed surveys. The EA concludes that the proposed activities are not likely to have an adverse effect on existing Eggert's sunflower occurrences based on impacts from previous disturbances. This can not be fully supported by current knowledge. Currently, the Air Force is monitoring the effects of timber harvest activities on Eggert's sunflower occurrences on portions of this proposed site. At this time, the impacts of various logging activities have not been fully evaluated. It is recommended that the Tennessee National Guard continue the monitoring activities established by the Air Force and to assess the impacts of the proposed development and use of these proposed training activities on this site. The Service is available to assist the Tennessee National Guard with future Eggert's sunflower issues on proposed training sites.

Thank you for the opportunity to comment on this action. If you have any questions, please contact Brad Bingham of my staff at 615/528-6481, ext. 205.

Sincerely,

Lee A. Barclay, Ph.D.  
Field Supervisor



STATE OF TENNESSEE  
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Division of Natural Heritage  
14th Floor L&C Tower  
401 Church Street  
Nashville, Tennessee 37243-0447  
Phone 615/532-0431 Fax 615/532-0231

March 19, 2003

James R. Orr, Project Manager  
ERM Southeast Inc.  
106 Crossroads Blvd., Suite 228  
Brentwood, Tennessee 37207

Dear Mr. Orr:

I am writing in response to the February 27, 2003 letter to the Tennessee Division of Natural Heritage (DNH) regarding the Tennessee Army National Guard Environmental Assessment For Proposed Laser-Firing Tank Range and Artillery Maneuver Area. The mission of the Tennessee Division of Natural Heritage is to restore and protect the plants, animals, and natural communities that represent the natural biological diversity of Tennessee, and we appreciate the opportunity to comment.

We found the Environmental Assessment (EA) rather complete and were pleased to find that such consideration was given to state and federal listed species. In fact, the map depicted in Figure 4-5 accurately represents the data which we currently have in our Biological Conservation Database. I should note, however, that the Aerospace Center Support (ACS) office at AEDC might have more recent data than we, and suggest that their biology staff be consulted during this process.

If the training activities do indeed adhere to the guidelines as described in the EA, we feel that the proposed action is unlikely to adversely affect state listed species. We would like to stress, however, that some of these state listed species are less common in Tennessee than some of the federal listed species. There are currently only five extant occurrences of *Prunus pumila* (sand cherry) in Tennessee, and all occur within ten miles of AEDC. Another very rare species in Tennessee is *Agalinis pseudaphylla* (Shiners' false foxglove). This species is not common globally and there are only three known extant occurrences in Tennessee. Both of the species occur within the Proposed Laser-Firing Tank Range and Artillery Maneuver Area, and a loss of even just one population could be detrimental to their existence within Tennessee.

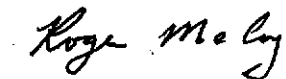
We ask that periodic surveys for rare animals be conducted, and operations be adjusted accordingly. Since animal species are mobile, this would help to ensure that no rare animal species are inadvertently impacted. AEDC is well known both for its sole Tennessee population of gopher frogs (*Rana capito*) and for an impressive population of pine snakes (*Pituophis melanoleucus*- State Threatened, Federal Management Concern). It is imperative that active maneuvers be directed away from known

concentrations of pine snakes or their den sites. Likewise, the impact of noise from this operation on these (and other) species should be carefully evaluated. I suspect that some useful data on this topic may be available from Eglin AFB in Florida. Please note that gopher frogs are known to vocalize under water during breeding season (late winter), and that they have a very faint call.

Cessation of tank maneuvers at certain times may be necessary to prevent disruption of breeding at nearby wetlands. Suspension of maneuvers also may be prudent in areas subject to seasonal migration of amphibians and reptiles to/from breeding pools. Numerous herpetofauna at AEDC are known to hibernate a considerable distance from seasonal breeding areas. To alleviate potential impacts to these species in high-use areas, it is imperative that tank operations be conducted in close coordination with the biology staff of ACS. Their expertise would prove helpful in designing operations protocols that will least impact native wildlife.

We do appreciate the opportunity to comment, and we thank you for considering Tennessee's rare species throughout the EA. Should you have any questions, please do not hesitate to contact me.

Sincerely,

A handwritten signature in cursive script that reads "Roger McCoy".

Roger McCoy  
Natural Heritage Program Coordinator

**Environmental  
Resources  
Management**

7106 Crossroads Blvd.  
Suite 228  
Brentwood, TN 37027  
(615) 373-3350  
(615) 373-2392 (fax)

May 1, 2003  
/8046/rcjol050103

Mr. Roger McCoy, Natural Heritage Program Coordinator  
State of Tennessee, Dept of Env and Cons  
Division of Natural Heritage  
14<sup>th</sup> Floor L&C Tower  
401 Church Street  
Nashville, TN, 37243-0447



Subject: Draft EA for Licensing of 7,000 Acres to the TNARNG at  
Arnold Air Force Base and Development of New Training  
Areas, (Endangered Species Review)

Mr. McCoy:

I greatly appreciate your comments to the above project dated March 19, 2003. You mentioned in your comments that we should contact the Aerospace Center Support (ACS) for more recent data regarding state and federally species.

I have met with Mark Moran, Geoff Call, and Kevin Fitch of ACS on various occasions and have received reports and mapping from their office. They have been most helpful and site visits with their personnel has been most informative.

As indicated in the DEA, approximately 50.5 acres of land will be utilized in this project for maneuvers and will be a gravel surface. These areas, the staging area, artillery maneuver areas, and laser target locations, have or will be reviewed by qualified biologists prior to development. The placement of these developed areas is based on the present mapping provided by ACS and your office, which indicate the lack of listed species.

Surveys of rare animals are ongoing at the base by ACS and we have reviewed recent reports regarding the Northern Pine Snake and other species. Appropriate measures will be taken to protect these species as described in the DEA.

If you have any questions concerning this project do not hesitate to contact me.

Sincerely,

James R. Orr  
Project Manager  
jim.orr@erm.com  
Enclosure  
JRO/gsq

c: Ralph Harder, TNARNG



Natural Resources Conservation Service  
675 U.S. Courthouse  
801 Broadway  
Nashville, Tennessee 37203

---

April 2, 2003

Mr. James R. Orr  
Project Manager  
ERM Southeast, Inc.  
7106 Crossroads Boulevard, Suite 228  
Brentwood, Tennessee 37207

Dear Mr. Orr:

In reviewing the Draft Environmental Assessment for the development of a laser firing tank range and artillery maneuver area within Arnold Air Force Base, the following comments are provided:

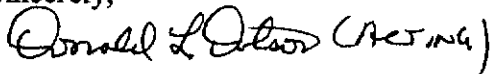
1. The Geology and Soils Section (4.1) suggest Guthrie as the only identified hydric soil within the proposed training area. Figure 4.1 shows Purdy, which is not mentioned in the text, but is currently listed as hydric for both counties. Purdy should be addressed in the text, possibly by describing that Purdy would by current soil mapping standards be mapped as Guthrie.
2. The soils section states that most of the soils within the proposed training area are prime farmland; however, in addressing impacts under the proposed alternative, no discussion addressing the impacts to prime farmland soils was noted. Since the Farmland Protection Policy Act addresses federal programs working toward minimizing irreversible conversion of prime farmland and the inventory addressed prime farmland, an impact assessment should be included. The consideration of no significant impact should be valid, as the proposed heavy use impacts, including the use of a few acres of the 50 acres having gravel placed, should not make these soils irreversibly converted to a non-croppable condition.
3. Section 4.2.3 states that Dickson and Lawrence can have a high vertical permeability and therefore a potential for deep percolation of spilled fuels. Since Dickson is a pan soil and Lawrence is poorly drained, the potential for contamination to deep aquifers should be slight or negligible. Also, based on Figure 4.1, there is no Holston soil mapped within the entire New License Area.
4. In addressing the impacts (Section 5 - Water Resources) to shallow and deep-water aquifers from spills, there is no detailed discussion of the selected "parking lot" sites and the aspect of minimal percolation and runoff. The staging area consists of several acres of both Mountview and Dickson soils. Four of the six proposed artillery pads will be on Dickson soils, but one appears scheduled to be on a Mountview soil and one on or near the Lobelville soil. The inventory indicates that soil percolation rates can range from zero to over seven inches an hour, but individual site assessments are weak in Section 5. Based on the fact that Dickson has a slower permeability than Mountview and that Lobelville is a streamside soil, from a water resources

standpoint maybe all six artillery pads and the predominant portion of the staging area for vehicles should be sited only on the Dickson areas. Also, the runoff potential for Dickson should be addressed so that the flatter areas of Dickson soils are selected (or buffered) to reduce contaminant risks in runoff.

5. Section 4.5 states that the valley soils are primarily Baxter and Guthrie. Again, Figure 4.1 does not show Baxter as a mapped series within the 7,000 acres, and the Guthrie series is usually located at the heads of drains in the upper headwaters. This statement is inconsistent with the map, as Lobelville and Purdy appear to be the more common streamside soils. Current mapping would also likely show much of the Guthrie shown along stream corridors as Taft.
6. Section 5.2.1.2, Operational Procedures, addresses minimizing potential impacts to water resources by means of vehicle maintenance, clean-up, maneuver rotations, and rhetorically states avoidance of "most sensitive" areas. The areas that are considered the most sensitive are unclear. Surface waters such as ponds are not mentioned. All streams were categorized as ephemeral, but those that would support fish on a seasonal basis are at least intermittent. Again, site selection for these "parking lots" should be addressed more fully with the best approach avoiding locating these sites where high infiltration soils or runoff near water resources is the most probable. All surface waters within the project area should have some setback or buffer distance addressed in this scoping process. If soil erosion impacts and potential spills cannot be totally eliminated, at least a forested riparian or herbaceous buffer of some designated width (e.g., 100 feet) can be specified. Establishing downslope buffers to intercept potential spills from gravel pads in the form of filter strips or small detention ponds (constructed wetlands) would be relatively easy and inexpensive to protect against the anticipated vehicles. It may be a better alternative than plugging existing drainage ditches and swales, especially if these systems are actually natural drainageways.
7. Section 5.4.1 impacts under the proposed action fails to state that there is or is not a potential loss of 50 acres of wildlife habitat under the proposed action. The strategy is to avoid wetlands, archaeological sites, and Eggert sunflower areas in site selection. All the impact discussion beyond this appears to be based on noise and infrequent maneuvers. Since the majority of the project appears designed to impact the small amount of early successional habitat available within the firing range, a discussion of how the early successional plant community will be managed or may be altered by the project may be appropriate, including a comparison of how it is currently managed.

Thank you for the opportunity to comment at this time.

Sincerely,



JAMES W. FORD  
State Conservationist

cc:

Gary Moore, DC, NRCS, Manchester, TN  
David Tapp, DC, NRCS, Winchester, TN  
Paul Fulks, AC, NRCS, Murfreesboro, TN

**Environmental  
Resources  
Management**

7106 Crossroads Blvd.  
Suite 228  
Brentwood, TN 37027  
(615) 373-3350  
(615) 373-2392 (fax)

April 30, 2003  
/8046/jfjol042903

Mr. James Ford  
State Conservationist  
Natural Resources Conservation Service  
675 U.S. Courthouse  
801 Broadway  
Nashville, TN 37203



Subject: NRCS comments to Draft Environmental Assessment (DEA)  
of Proposed Licensing of Property at Arnold Air Force Base  
and Development of New Training Areas

Mr. Ford:

greatly appreciate your comments to the above referenced document. I  
ave provided response to the seven (7) comments you made to the  
EA. Your letter is attached as reference to the comments.

Purdy soils will be identified in the text as hydric soils.

Section 5.1.1.1 addresses the impacts to soils in the proposed project.  
While the Franklin County Soil Survey indicates that the area  
contains "prime farmland", the project area is not presently used as  
prime farmland nor will it be used for this purpose in the foreseeable  
future. No significant impacts to farmland should be valid as the  
proposed use of the 50 acres that will be graveled will not make these  
soils irreversibly converted to a non-cropable condition.

Dickson and Lawrence soils will be removed from the last paragraph  
of Section 4.2.3. Holston soils will be included on Figure 4-1 upon  
verification of that series on the project site.

Fueling will not take place on the artillery pads or staging area.  
Potential contamination of water resources due to fuel is  
insignificant. Flatter areas will be selected for the artillery maneuver  
areas to enhance the training. Runoff from these areas should be  
minimal.

The changes in the soils types for highlands and valleys have been  
noted.





DEPARTMENT OF THE ARMY  
NASHVILLE DISTRICT, CORPS OF ENGINEERS  
Regulatory Branch  
3701 Bell RD  
Nashville, TN 37214

IN REPLY REFER TO

April 10, 2003

Regulatory Branch

SUBJECT: File No. 200300314; Request for Comments on New Training Area and Facilities, Arnold Air Force Base, Coffee County, Tennessee

Mr. James R. Orr, Project Manager  
ERM Southeast Inc.  
7106 Crossroads Boulevard, Suite 228  
Brentwood, Tennessee 37207

Dear Mr. Orr:

This is in reference to your request for comments on the draft environmental assessment concerning a proposal to license 7,000 acres from Arnold Air Force Base (AAFB), and to construct within this area a laser firing tank range and a six-station artillery maneuver area for the Tennessee Army National Guard (TANG). Please refer to File No. 200300314 in future correspondence related to this proposal. The following comments on the draft assessment are hereby offered.

Of the 7,000 acres, only 50.1 acres within the licensed area would be affected by the proposed construction of the tank range and artillery maneuver area. Within this affected area, two jurisdictional wetlands are located within the proposed tank range, but would not be disturbed by development. It should be noted here that the determination establishing these sites as jurisdictional wetlands was performed in 1993. You are advised that our office does not recognize wetland jurisdictional determinations that are more than five years old.

Regarding the statement at p5.2.1.2, any modification of existing drainage ditches and swales to act as siltation or catchment basins will require review by our office. In addition, a Department of the Army (DA) permit pursuant to Section 404 of the Clean Water Act would be required for any work in which waters of the United States, including contiguous and adjacent wetlands, would be filled or otherwise impacted. Work within the floodplain does not necessarily require DA authorization unless the work fills or impacts a blue line stream or wetland.

- 2 -

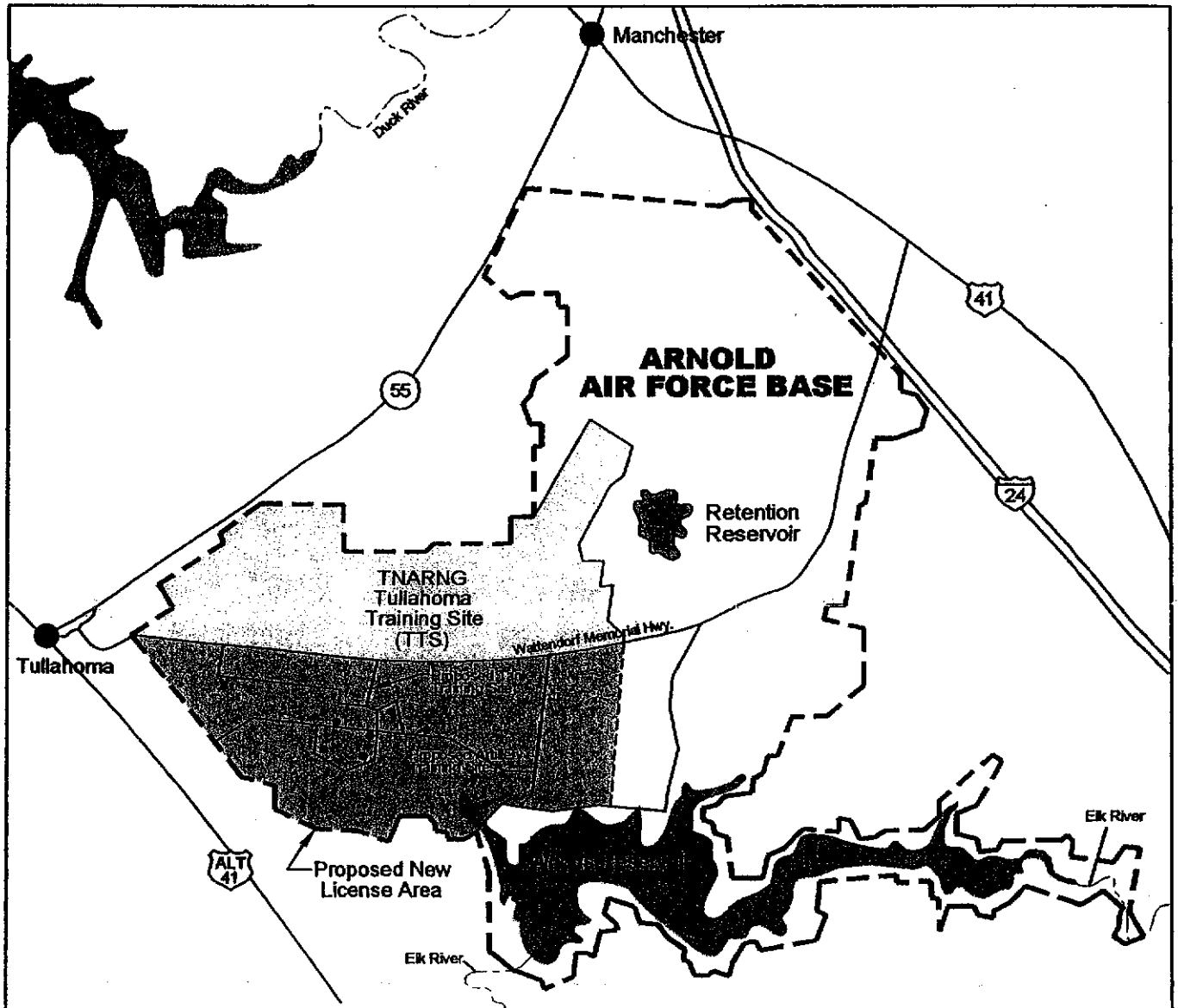
Thank you for the opportunity to comment on this proposal.  
If you have any questions, you can contact me at the above address  
or telephone (615)369-7507.

Sincerely,

A handwritten signature in cursive script, appearing to read "Richard D. Graham".

Richard D. Graham  
Regulatory Specialist  
Operations Division

Enclosure



NOT TO SCALE

**Environmental  
Resources  
ERM Management**

**PROPOSED LICENSE AREA  
AND TRAINING LOCATIONS  
AAFB  
TULLAHOMA, TENNESSEE**

**FIGURE**

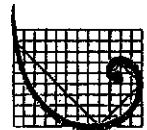
**2-2**

**Environmental  
Resources  
Management**

7106 Crossroads Blvd.  
Suite 228  
Brentwood, TN 37027  
(615) 373-3350  
(615) 373-2392 (fax)

April 30, 2003  
/8046/rgjol043003

Mr. Richard Graham  
Regulatory Specialist  
Department of the Army  
Nashville District, Corps of Engineers  
3701 Bell Rd.  
Nashville, TN 37214



**ERM.**

Subject: Response to Comments on New Training Area and Facilities,  
Arnold Air Force Base, COE file No. 200300314

Mr. Graham:

I appreciate your comments to the above referenced project. You provided two comments which I would like to respond to. You indicated that your office does not recognize wetland jurisdictional determinations that are more than five years old. While it was not within the scope of this project to conduct wetlands determinations, ERM did review the site to confirm the presence or absence of wetlands in the proposed impact area. The wetlands mapping provided in the Draft Environmental Assessment (DEA) was acquired from the wetlands data base prepared by the Aerospace Center Support (ACS) at Arnold Center. We found that the wetlands mapped by ACS were located at the two sites which are found in the tank training area. These two areas will not be impacted by the project as the tanks will use the existing roads and will not go off road.

Regarding the statement at 5.2.1.2, "Drainage ditches and swales could be modified to act as siltation or catchment basins..."; one blue line stream is located on the 50.1 acres proposed for this project at the proposed staging area. Upon inspection, this stream was dry and considered to be ephemeral. The construction of the staging area will not result in the filling or otherwise impacting of this drainage. An erosion control plan will be prepared prior to the construction of the staging area to control potential impacts to this drainage. In the event plans call for the filling of this drainage, the Guard will apply for a Department of Army permit (Section 404).

If you have any questions concerning this project, do not hesitate to contact me.

Sincerely,

James R. Orr  
Project Manager  
jim.orr@erm.com

Enclosure  
JRO/gsq  
c: Ralph Harder, TNARNG



## TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER  
P. O. BOX 40747  
NASHVILLE, TENNESSEE 37204

April 4, 2003

James R. Orr, Project Manager  
ERM Southeast Inc.  
7106 Crossroads Blvd., Suite 228  
Brentwood, TN 37207

RE: Draft Environmental Assessment For Proposed Laser-Firing Tank Range and Artillery  
Maneuver Area  
Arnold Air Force Base

Dear Mr. Orr:

This letter provides comment from the Tennessee Wildlife Resources Agency on the Tennessee Army National Guard proposal to license 7,000 acres of property from the Arnold Air Force Base (AAFB) for development of a laser-firing tank range and artillery maneuver training areas. Alternatives within the AAFB that were dropped from consideration include those which would have had increased impacts on natural resources than those claimed for the preferred alternative.

For reasons presented below, we disagree with the categorical statement under CONCLUSIONS (page ES-3) that "The selection action will not have a negative impact on natural resources of the area....". Although a case is made for the convenience of a centrally located facility that would serve surrounding units, we do not believe that development of other sites is impractical considering the environmental effects of the proposed development. Forts Knox and Campbell appear reasonably centrally located compared to the subject site.

We maintain that wildlife use of the area would be significantly affected by the development and activity that would follow. Pointed out in the Draft Environmental Assessment (DEA) is a 200 acre food plot managed by TWRA which lies within the proposed training area. The laser firing tank range would completely remove a 94 acre dove field providing hunting for over 450 hunters each opening day of dove season. Deer, wild turkey, dove, racoon, squirrel, rabbit and quail hunting provide over 30,000 man-days of recreation on the AEDC Wildlife Management Area. Restricting or removing these 7,000 acre from the hunting program would negatively impact that use in the area and restrict the ability of TWRA to manage these wildlife populations.

We are also concerned for the effects of this proposal on several rare species. The northern pine snake (Tn. Threatened), slender glass lizard (Deemed In Need of Management), and southeastern shrew (Deemed In Need of Management) are all known to occur within the subject 7,000 acres. These species typically exist in shallow underground burrows. Maternity burrows of the

The State of Tennessee

northern pine snake could be subject to collapse from heavy equipment traffic. Similar negative impacts could be expected for all burrowing species as well as the runways of other rodents serving as prey for these rare species.

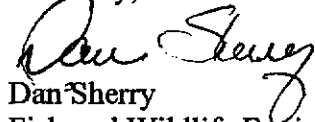
The northern pine snake is a secretive species sensitive to human activity which could cause the species to disappear if not directly killed (road kill). The latter has been documented as a significant impact to the closely related Louisiana pine snake which, until recently was considered a subspecies of the northern pine snake. Life habits are similar for the two species. Clutch size of the northern pine snake can be variable and years of decreased fecundity or survival caused by increased human/equipment activity and habitat alteration could threaten its survival at AEDC.

Although no perennial streams exist in the proposed tank or artillery areas, intermittent streams and drainages would be subject to increased sediment which could affect the flame chub (Deemed In Need of Management) living in Spring Creek which receives flow from these headwater drainages. The flame chub is sensitive to siltation. Karst topography could also receive incidental spillage of hydraulic fluids and oils which may leach into the groundwater or be transported by runoff into Spring Creek or other water sources.

In summary, the TWRA believes that this proposal impacts wildlife much more negatively than is characterized in the DEA. Given the availability of alternatives at other sites, we strongly recommend that this license not be granted.

Thank you for considering these comments.

Sincerely,



Dan Sherry  
Fish and Wildlife Environmentalist

DS:bg

cc: Steve Patrick  
Richard Kirk

**Environmental  
Resources  
Management**

7106 Crossroads Blvd.  
Suite 228  
Brentwood, TN 37027  
(615) 373-3350  
(615) 373-2392 (fax)

June 27, 2003  
/8046/DSJOL062703

Mr. Dan Sherry  
TWRA  
P.O. Box 40747  
Nashville TN. 37204



**Subject:** Draft EA for Licensing of 5,000 Acres to the TNARNG at Arnold Air Force Base with a "Revised" Proposed Training Plan and Schedule for Approximately 150 Directly Impacted Acres.

Dear Mr. Sherry:

**Overview:**

On June 17, 2003, Mr. Ralph Harder of the Tennessee Army National Guard (TNARNG) and I met with you and Mr. Steve Patrick regarding the above referenced project. This past May 2003, Mr. Harder and I had met with you and others from your office to review comments regarding the proposed new Tank and Artillery Training Areas at Arnold Air Force Base (AAFB). The original plan proposed that the TNARNG license 7,000 acres of land and utilize existing roads and open areas of the South Camp Forrest area as well as travel lanes for tank training and targeting locations. The plan proposed the use of existing roads and land to the southeast of South Camp Forrest as an artillery training area. This proposed tank training area plan originally included the use of TWRA's 130 acre dove hunt field and food plot for placement of targets. While the use of this area would not have conflicted with the annual dove hunt, it would have required the clearing of trees for the line of sight firing and observation during training. In addition, the proposed plan would have located targets on the land adjoining the food plot to the east that was clear-cut in January 2002 (management unit 7452) and in the land between Roads 5 and 6 south of these two tracts. The plan also proposed the training use to be estimated at 30 weekends per year.

The concerns of the TWRA, included the disruption of hunting in the dove field and food plot area, the potential taking of Eggert's sunflower (*Helianthus eggertii*) in management unit 7452 and other locations, and the potential impacts to other wildlife and special concern species such as (northern pine snake).



**Course of Action:**

Significant consideration was given to the comments of your agency as well as those of the United States Fish and Wildlife Service (F&WS) and the Aerospace Center Support (ACS). In light of those comments, the TNARNG has reviewed all possible ways to mitigate impacts to natural resources and the recreational use of the area. TNARNG has negotiated extensively with battalion commanders and staff to revise and reshape the proposed training plan and schedule dates in order to maximize the protection of these resources and, at the same time enable the TNARNG with an improved training area.

Attached you will find a revised Section 2, Description of the Draft Environmental Assessment (DEA). This description identifies the minimum acceptable training plan for approximately 150 affected acres that provides for the TNARNG training needs as well as have the minimum impact on natural resources of the area. Attached are the Figures identified in this section, however, no figures are finalized at this time due to the recent changes and ongoing cooperation efforts.

Please review the description of the proposed "revised" training plan and forward any comments and/or recommendations concerning back to me. We shall revise the DEA as required, and the Final EA and Draft FNSI shall be submitted with operational procedures included. We anticipate this EA shall result in a Finding of No Significant Impact (FNSI).

Thank you for your time and assistance in this mater.

Sincerely,



James R. Orr  
Project Manager  
jim.orr@erm.com

Enclosure  
JRO/gsq

c: Ralph Harder, TNARNG  
Brad Bingham USFWS  
Mark Moran ACS



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

446 Neal Street  
Cookeville, TN 38501

July 16, 2003

Mr. James Orr  
Project Manager  
Environmental Resources Management  
7106 Crossroads Blvd.  
Brentwood, Tennessee 37027

Subject: Draft EA for Licensing of 5,000 acres to the Tennessee Army National Guard.

Dear Mr. Orr:

Fish and Wildlife Service (Service) biologists have reviewed the subject document and we offer the following comments concerning the proposed action and draft assessment.

The scope and extent of the proposed training area have been modified to account for resource concerns that were expressed by several agencies. Based on the project description provided in the draft assessment, potential adverse effects to the federally threatened Eggert's sunflower have been significantly reduced. However, scattered occurrences of the sunflower may still be adversely affected. It is recommended that the specific site location of each segment of the project be surveyed by a qualified botanist for potential occurrences, and that appropriate actions be taken to avoid impacts to this species to the extent possible. The clearing of overstory vegetation and sequential maintenance of open vegetative areas should be performed in a manner that benefits Eggert's sunflower. The findings of the survey, the measures that will be implemented at each occurrence to limit/eliminate adverse impacts, and the measures that will be incorporated into the future vegetative maintenance program that will protect and enhance Eggert's sunflower habitat should be provided to the Service. Once the requested information is provided, consultation with the Service as required under Section 7 of the Endangered Species Act can be completed.

Based on available information, road improvements especially associated with the artillery maneuver area may result in the loss of wetland habitat. The subject assessment should address potential wetland impacts and identify measures that will be implemented to mitigate for unavoidable impacts. The assessment should also discuss the rationale for requesting a license from the Air Force to use 5,000 acres when the current document describes the proposed use of only a small fraction of the requested area. The draft assessment should fully describe all activities that will occur throughout the requested license area and discuss their impacts.

If you have any questions concerning our comments, please contact Doug Winford or Brad Bingham of my staff at 931/528-6481, ext. 215 or 205, respectively.

Sincerely,

A handwritten signature in cursive script, reading "Lee A. Barclay".

Lee A. Barclay, Ph.D.  
Field Supervisor

xc: Mark Moran, ACS  
Steve Patrick, TWRA  
Dan Sherry, TWRA  
Ralph Harder, TNARNG

## **Memorandum to File, January 14, 2004**

**Subject:** Comments to Draft Environmental Assessment, Tank Training AAFB.

**Prepared by:** James R. Orr, Project Scientist, URS Corp

The United Southeastern Tribes (USET) were contacted by Ms. Ida Prather, Natural Resources Manager with the TNARNG, for comment to the Draft "Environmental Assessment for Proposed Laser-Firing Tank Range and Artillery Maneuver Area, Arnold Air Force Base, Tennessee", in February 2003. According to Ms. Prather, the USET has not provided written comment to the Draft EA. In addition, during communication with the USET, no negative verbal comment to the Draft EA has been received.

18 August 2004

## MEMORANDUM FOR HQ AFMC/MSEVO

FROM: HQ AFMC LOJAVE  
4225 Logistics Avenue Suite, Room N 237  
Wright-Patterson AFB OH 45433-5762

SUBJECT: Review of Draft EA & FONSI for Laser Firing Tank Range and Artillery Training Areas, Arnold AFB, TN

1. We have reviewed the draft EA and FONSI for the above-referenced proposed project, and find them legally sufficient. We offer the following comments about these documents.
2. Arnold AFB (AAFB) proposes to license to the Tennessee Army National Guard (TNARNG) 1,264 acres of land on AAFB to establish a laser firing tank training and artillery maneuvering area. The laser firing tank range utilizes approximately 102 acres, and would consist of two 5,900-foot firing lanes, approximately 25 targets, an observation tower, a seven-acre staging area and the use of roads on 4.6 acres as ingress and egress from the laser firing area. The artillery maneuver area will utilize approximately 52 acres consisting of six five-acre plots for artillery set-up and simulated fire, a 12-acre staging area and roads on a 10-acre section of land. TNARNG proposes to use the tank training area four to eight weekends per year and the artillery maneuver area two to four weekends per year. An estimated 120 soldiers will participate in the tank training per training weekend and 475 soldiers will participate in artillery training per training weekend.

3. EA Comments

- a. Description of Laser Firing Mechanism

The EA does not include a description of the laser firing system to be used by the TNARNG. The EA should include the salient physical characteristics of the laser firing mechanism and laser beam (e.g. wavelength, time, strength, range), safety measures to be used by TNARNG members and observers, precautions to prevent inadvertent or accidental exposure by the general public, dangers (if any) to wildlife posed by firing the laser, and characteristics of the targets.

- b. EBS survey

The EA should reference any environmental baseline survey of the 1264 acres. If one has not been done, the proponent should complete one prior to executing the license (see AFI 32-7066, paragraph 1.1).

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**ACRONYMS**

AAFB	Arnold Air Force Base
ACM	Asbestos-Containing Material
AEDC	Arnold Engineering Development Center
AFB	Air Force Base
AFI	Air Force Installation
AOI	Area of Interest
AQCR	Air Quality Control Region
AST	Aboveground Storage Tank
ATSDR	Agency for Toxic Substances and Disease Registry
Bde	Field Artillery Brigade
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRM	Cultural Resources Management
CRMP	Cultural Resources Management Plan
CVOC	Chlorinated Volatile Organic Compound
DOD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EOD	Exploded Ordnance
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FMTV	Family of Medium Tactical Vehicles
FONSI	Finding of no Significant Impact
GIS	Geographic Information System
HMMWV	High-Mobility Multipurpose Wheeled Vehicle

HUD	U.S. Department of Housing and Urban Development
ICM	Interim Corrective Measures
IPP	Invasive Pest Plant
IRP	Installation Restoration Program
MC	Management Concern
MLRS	Multiple Launch Rocket System
MTP	Military Training Procedure
MU	Management Unit
MVSA	Motor Vehicle Storage Area
M-113	Vietnam-Era U.S. Army Armored Personnel Carrier
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROW	Right-of-Way
SAIC	Science Applications International Corporation
SATB	Standard Airdrop Training Bundle
SHPO	State Historic Preservation Officer
SWMU	Solid Waste management Unit
TDA	Tennessee Division of Archaeology
TDNH	Tennessee Division of Natural Heritage
TMD	Tennessee Military Department
TNARNG	Tennessee Army National Guard
TN-EPPC	Tennessee Exotic Pest Plant Council
TTS	Tullahoma Training Site
TVA	Tennessee Valley Authority

TWGSS/PGS	Tank Weapons Gunnery Simulation System / Precision Gunnery System
TWRA	Tennessee Wildlife Resources Agency
USAF	United States Air Force Base
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WTP	Water Treatment Plant

### **UNITS OF MEASUREMENT**

cm/sec	centimeters/second
dB	decibel
dBA	A-weighted sound level
DNL	Day-night sound level
L <sub>eq</sub>	equivalent sound level
mg/L	milligrams per liter
mm	millimeter, equivalent to 0.039 inch
PM	Particulate matter
PM <sub>10</sub>	particulate matter less than or equal to 10 micrometers in diameter
sq ft	square foot
µg/m <sup>3</sup>	micrograms per cubic meter



### **CHEMICAL ABBREVIATIONS**

CO	carbon monoxide
NO <sub>2</sub>	nitrogen dioxide
NO <sub>x</sub>	nitrogen oxide
O <sub>3</sub>	ozone
Pb	lead
PCB <sub>s</sub>	polychlorinated biphenyls
S <sub>02</sub>	sulfur dioxide
VOCs	volatile organic compounds



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MTI 02388 03/25/02

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ARNOLD AE SITE

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ARNOLD AFB SITE

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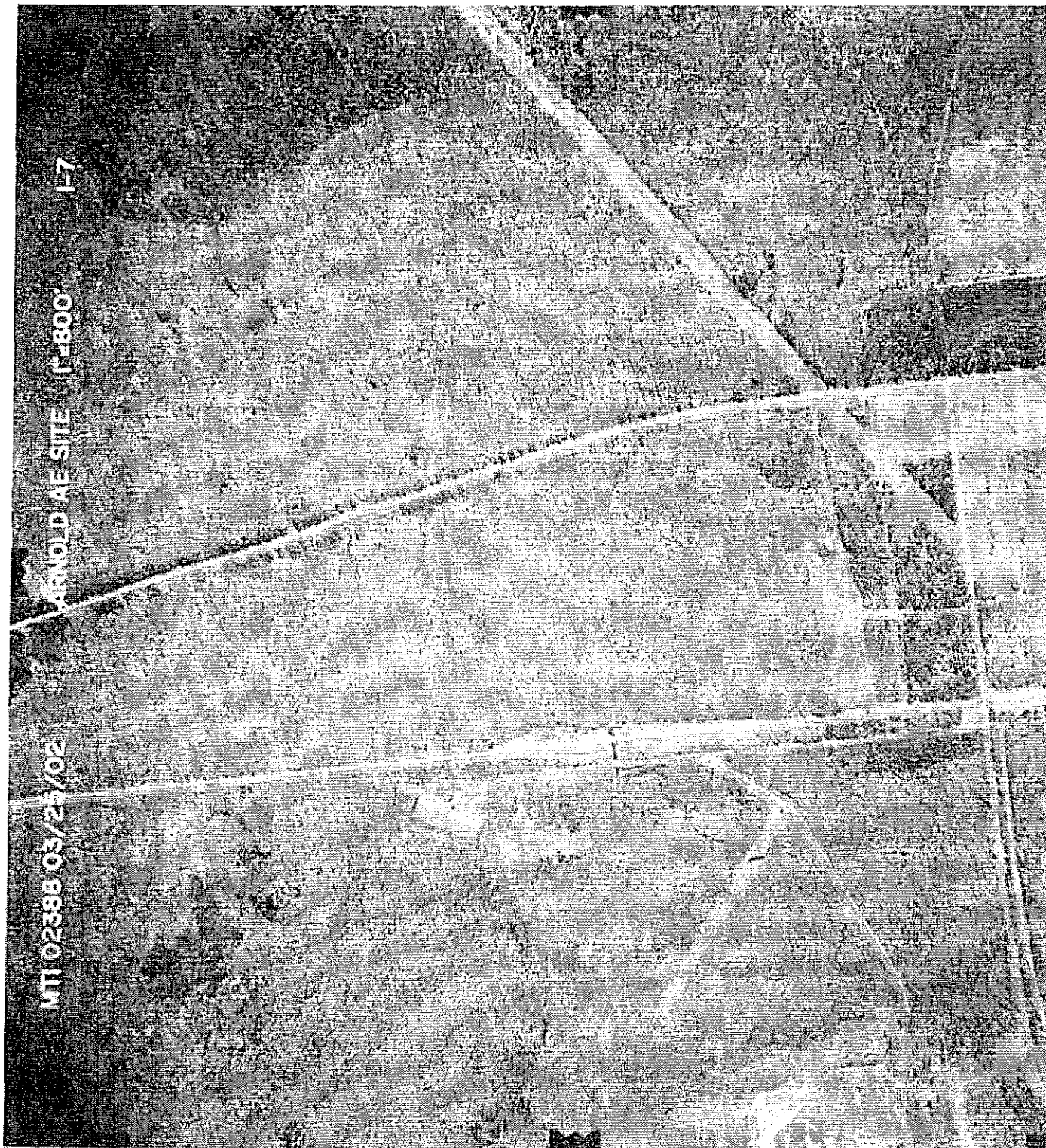




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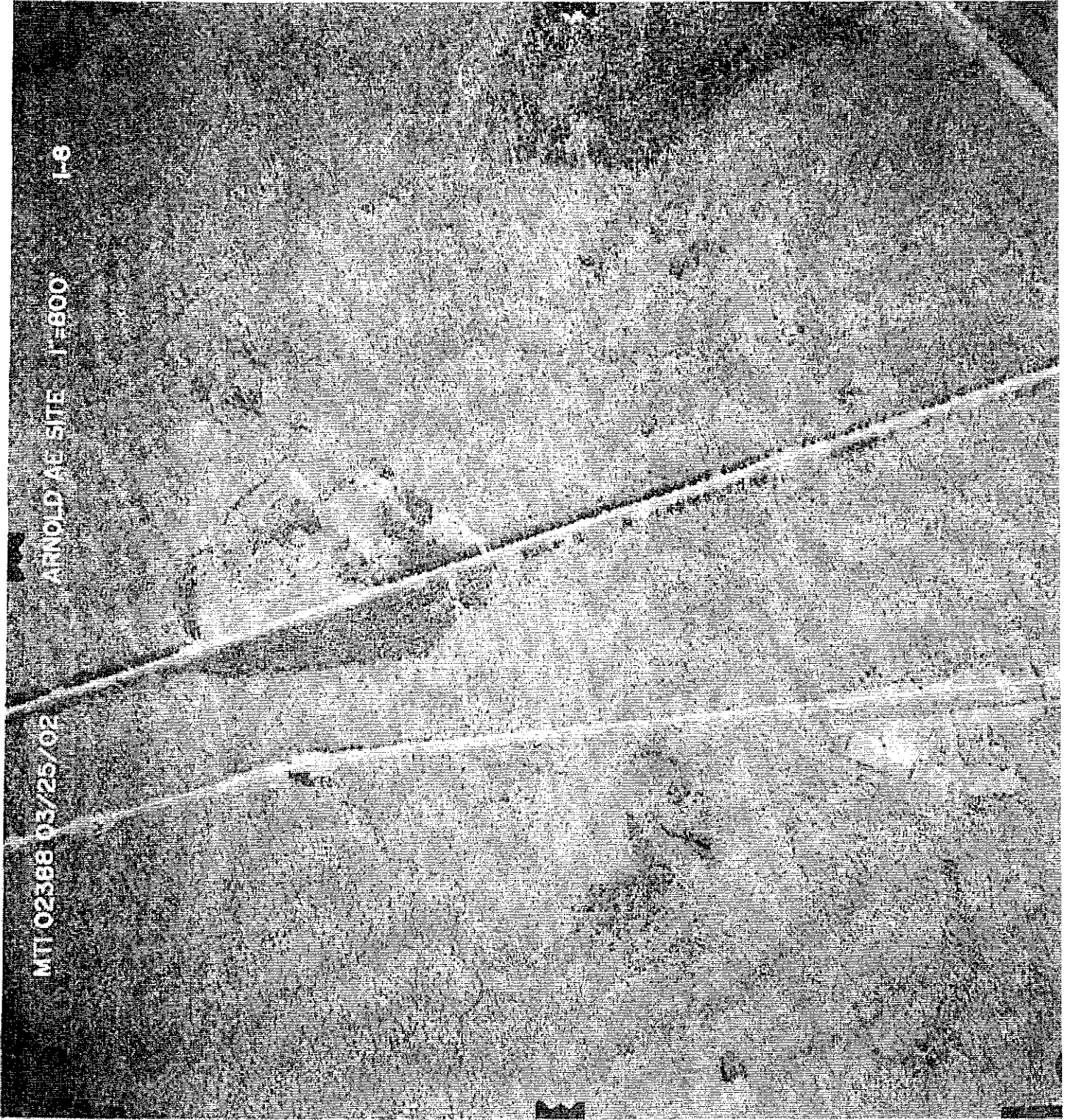
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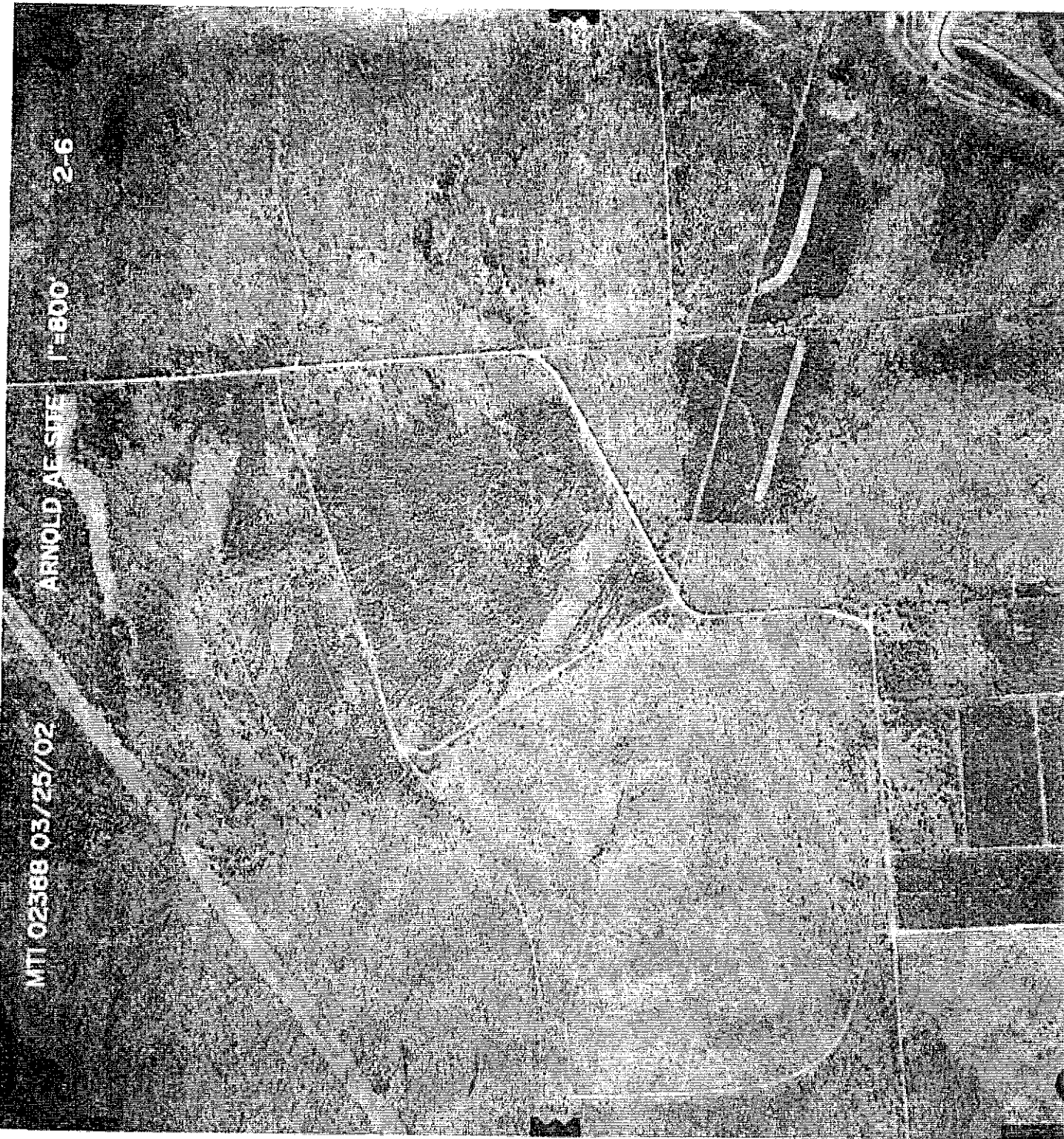


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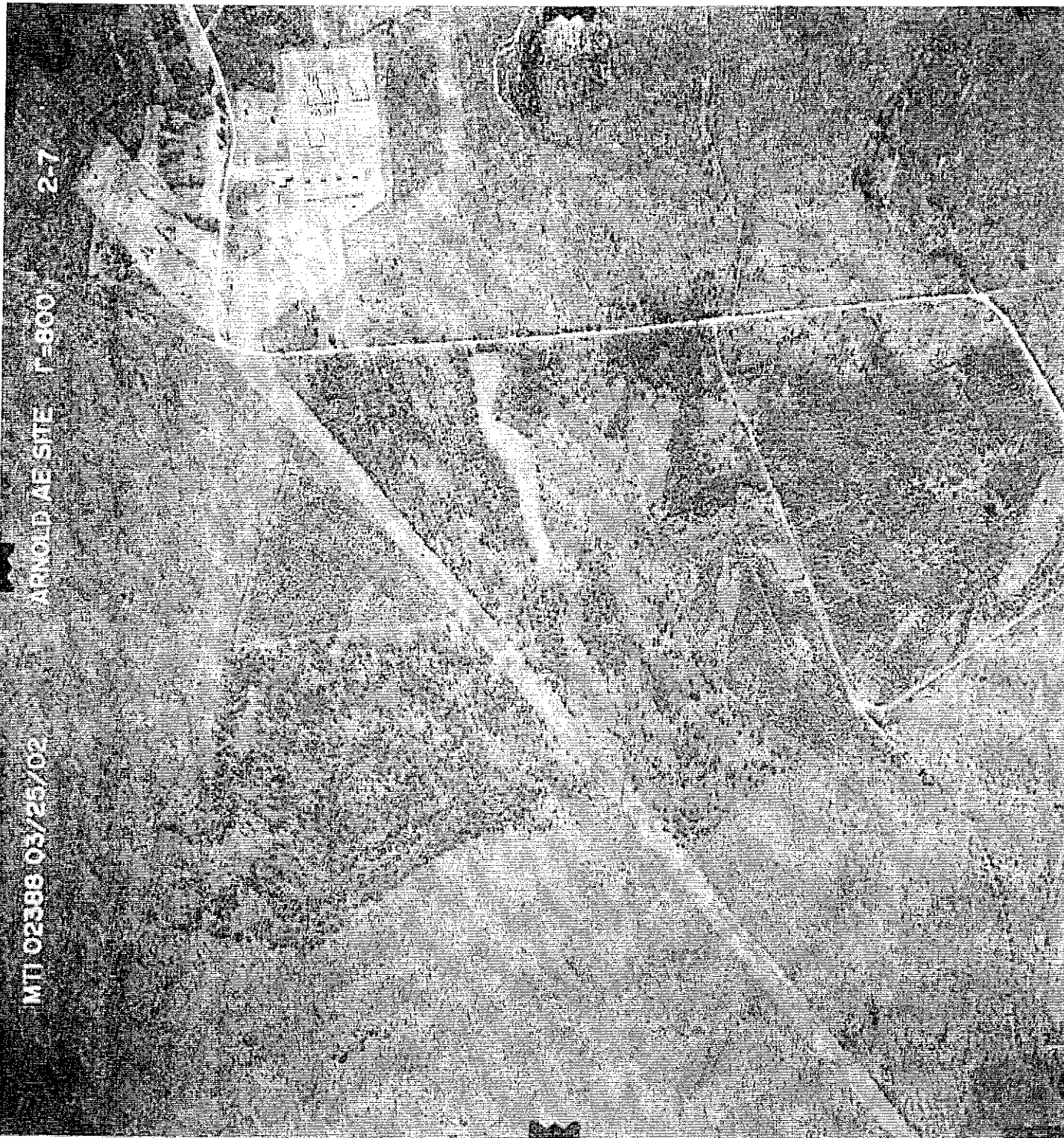
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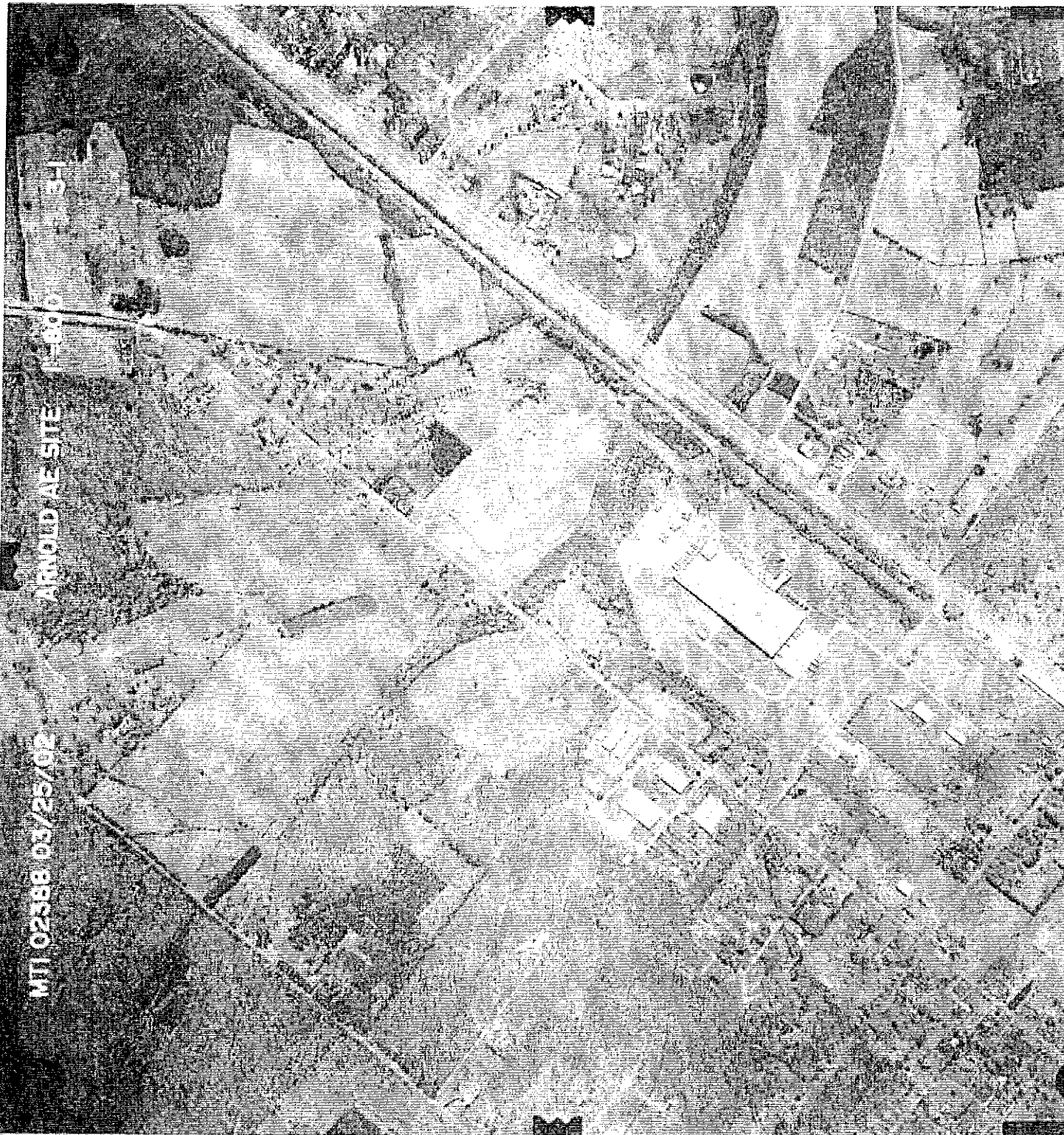
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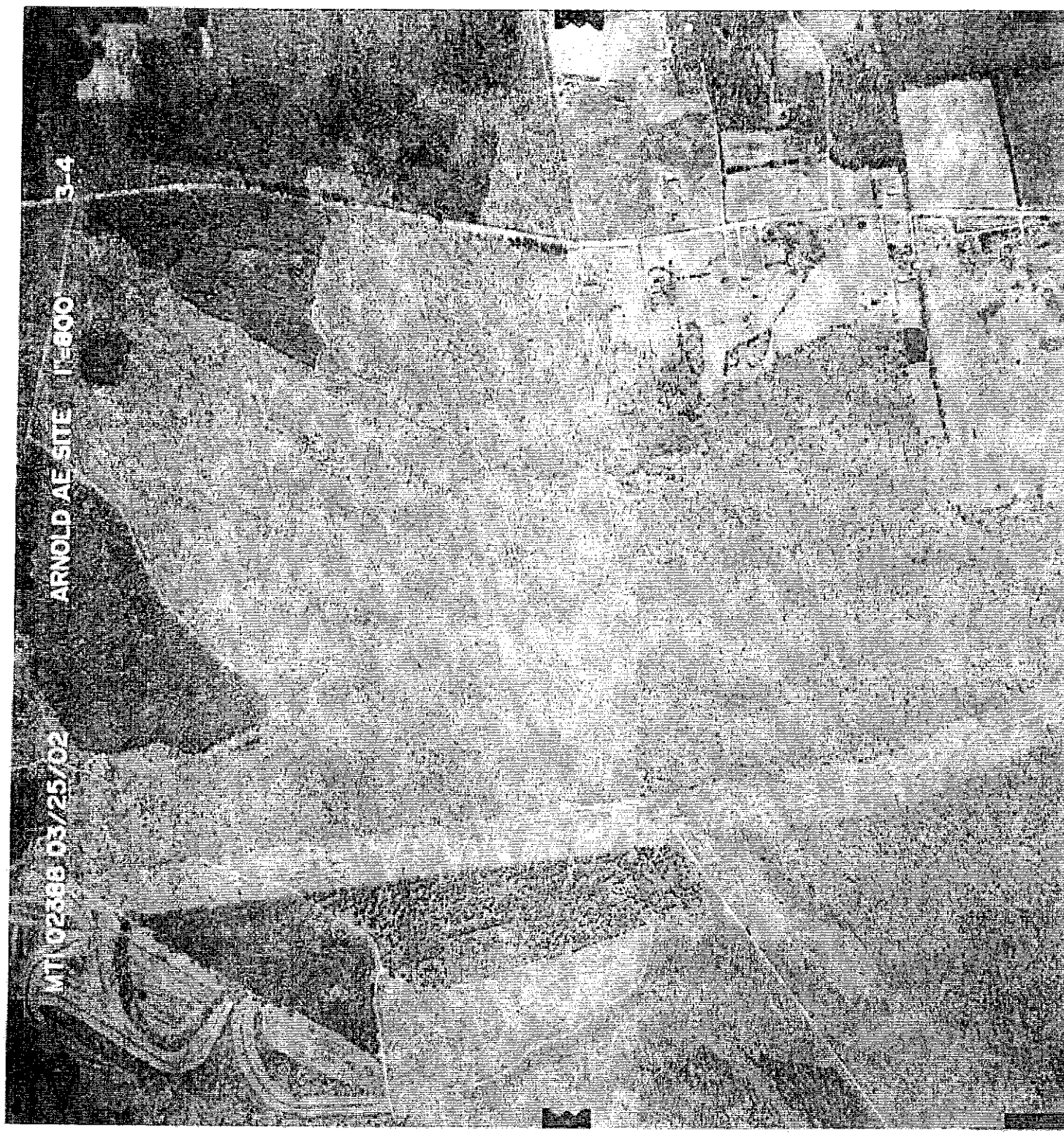




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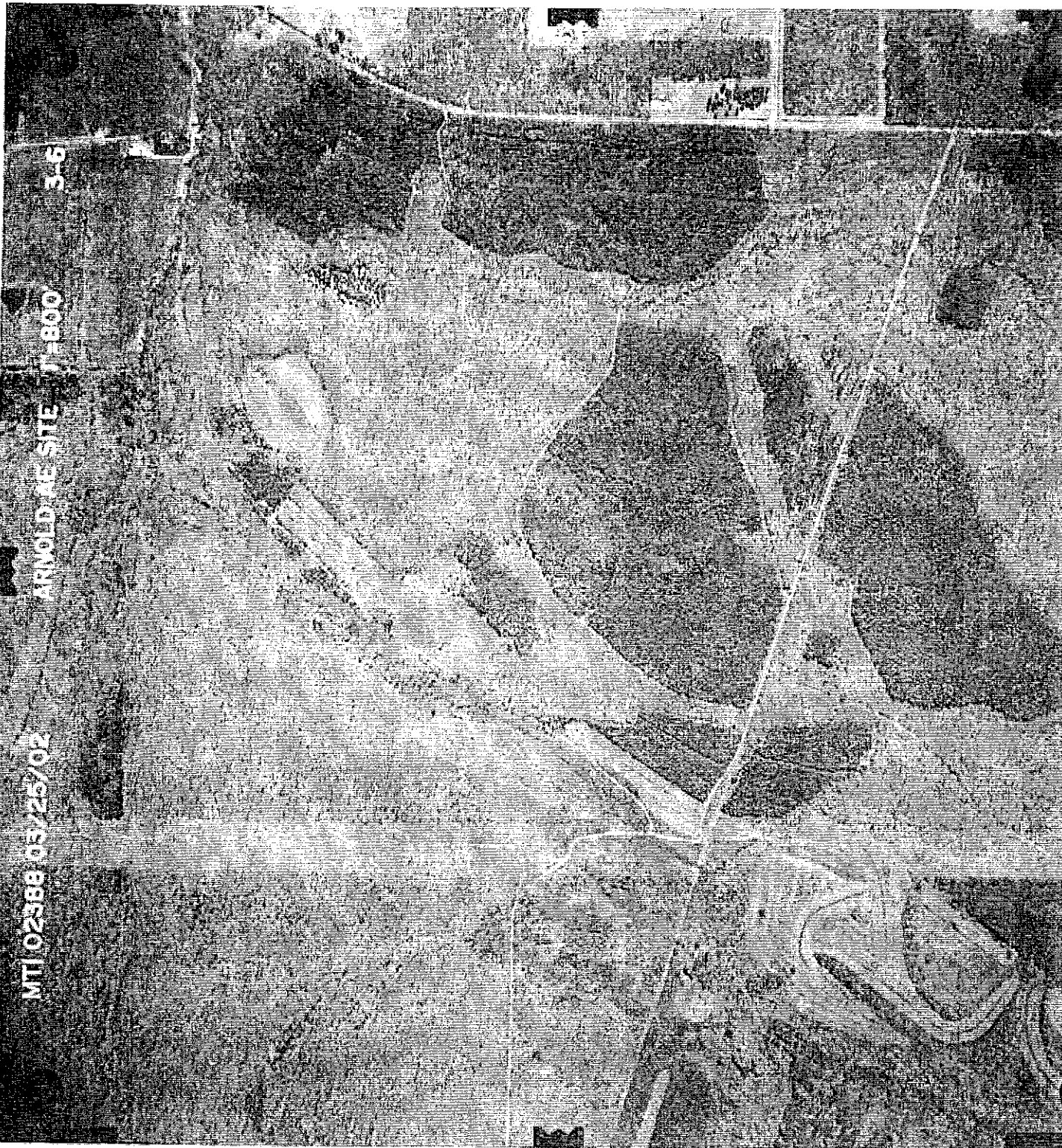




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